ANTHROPOLOGIAI KÖZLEMÉNYEK

A MAGYAR BIOLÓGIAI TÁRSASÁG
EMBERTANI SZAKOSZTÁLYÁNAK FOLYÓIRATA

Szerkeszti
EIBEN OTTÓ és BODZSÁR ÉVA

38. kötet 1-2. füzet

MAGYAR BIOLÓGIAI TÁRSASÁG
Hungarian Biological Society

BUDAPEST
1996/1997

ANTHROPOLOGIAI KÖZLEMÉNYEK

(Founded by M. MALÁN)

Editors: M. MALÁN (1954-1967), J. NEMESKÉRI (1968-1976)

A periodical of the Anthropological Section of the Hungarian Biological Society

Editors: O. G. EIBEN & É. B. BODZSÁR

Felhívás a szerzőkhöz

Az Anthropologiai Közlemények a Magyar Biológiai Társaság Embertani Szakosztályának folyóirata, a Magyar Tudományos Akadémia Biológiai Tudományok Osztályának felügyeletével és támogatásával jelenik meg. Szerkeszti a szerkesztőbizottság.

A szerkesztőbizottság elfogad a biológiai antropológia, ill. az általános (nem klinikai) humángenetika témaköréből önálló vizsgálatokon alapuló tanulmányokat, továbbá olyan kritikai vagy szintézist tartalmazó közleményeket, amelyek az embertani tudomány előbbrevitelét szolgálják. A közlés alapfeltétele általában az, hogy a tanulmányt a szerző a MBT Embertani Szakosztályának szakülésén előadja.

Az előadásokat a szakosztály titkáránál lehet bejelenteni és azok műsorra tűzéséről a Szakosztály intézőbizottsága dönt.

Az Anthropologiai Közleményekhez közlésre benyújtott kéziratok tartalmi és formai követelményei a következők:

1. A tanulmányok világosan fogalmazott célkitűzésű, korszerű módszerekkel végzett vizsgálatok igazolt, bizonyított eredményeit tartalmazzák, tömör és érthető stílusban. A tanulmányok terjedelme mondanivalójuk mértékéhez igazodjon. A rendelkezésre álló évi 12 ív terjedelem korlátozza az egyes tanulmányok terjedelmét, ezért 2 szerzői ívet meghaladó terjedelmű kéziratokat nem áll módunkban elfogadni. A történeti antropológiai tanulmányoknál egyedi méreteket - őskori és honfoglalás kori szériák kivételével - általában nem közlünk.

2. A kéziratot A/4 alakú fehér papírra, kettős sorközzel, a papírlapnak csak az egyik oldalára kell írni, oldalanként 25 sor, soronként 55-60 betűhely lehet. A kéziratot kérjük Winword 6 szövegszerkesztő, illetve Excel táblázatszerkesztő és ábrakezelő (vagy ezekre konvertálható) programmal elkészíteni, és a floppyt, továbbá a kézirat két kinyomtatott példányát beküldeni szíveskedjék.

3. A tanulmány címoldalán 150 szónál nem nagyobb terjedelmű, angol nyelvű *Abstract*-ot közlünk. A fordításról - ha a szerzőnek nem áll módjában - a szerkesztő gondoskodik.

4. A tanulmányhoz tartozó táblázatoknak, ábráknak az Anthropologiai Közleményeknél az utóbbi évfolyamokban kialakult egységes gyakorlatot kell követniük.

A táblázatokat a tudományos dokumentáció elveinek figyelembevételével kell megszerkeszteni. Az egyes tanulmányokhoz tartozó azonos típusú táblázatoknak egységeseknek kell lenniük. A folyóirat tükrébe be nem férő táblázatok több részre osztandók; több oldalas (behajtós) táblázatokat nyomdatechnikai okokból nem fogadunk el. Minden táblázatot külön lapra kell gépelni, sorszámmal és címmel kell ellátni.

5. Csak gondos kivitelű és fotózásra alkalmas minőségű ábrákat fogadunk el. A rajzon alkalmazott jelölések világosak, egyértelműek legyenek. Minden ábrát, függetlenül attól, hogy vonalas rajz vagy fotó, ábra jelöléssel, sorszámmal és aláírással kell ellátni. A műnyomó papírt igénylő fényképeket tábla formájában közli a lap; ezek összeállításánál a szerzőknek a tartalmi követelmények mellett az esztétikai szempontokat is figyelembe kell venniük.

Folytatás a borító 3. oldalán

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**A 6. Nemzetközi Humánbiológiai Szimpozium érmének első és hátoldala,
Kiss Sándor szobrászművész alkotása**

**The bronze plaquette of the Sixth International Symposium of Human Biology
(Veszprém, 10-13 June, 1996), made by Mr. Sándor Kiss, sculptor.**

PLANTIN
Kiadó és Nyomda Kft.
Publishing and Press Ltd. Company
97.236

EDITORIAL

Anthrop. Közl. *38;* 3-4. (1996/97)

SIXTH INTERNATIONAL SYMPOSIUM OF HUMAN BIOLOGY VESZPRÉM, 10-13 JUNE, 1997

Opening Address
by O. G. Eiben

We cordially welcome all participants of our Sixth International Symposium.

The series of Symposium of Human Biology in Hungary (organized by O. G. Eiben) has already a nice tradition. The meetings have always had a remarkable international participation. The first Symposium was organized in Balatonfüred in 1976 under the title „Growth and Development; Physique". The second one was held in Visegrád in 1979 on „Functional Biotypology". The third Symposium in Bozsok in 1981 „Variations in Human Growth and Physique" was combined with the Centenarian Congress of Anthropology of the Department of Anthropology, Eötvös Loránd Univesity in Budapest. The fourth Symposium was organized in Pécs in 1986 on „Growth Standards", and the fifth one in Keszthely in 1991 about the „Youth at the End of the 20th Century".

This time the theme of the Symposium is „Natural Endowments and Possibilities in Human Growth". The organisers want to discuss the genetic endowments influencing growth and maturation of children, in other words the growth pattern in general as well as all the ecological/economical factors influencing the complex process of growth and development. We have had to experience a decreasing living standards in Hungary in the last years, and its consequences closely affect the children and young people. The issue of the Symposium is very timely.

In order to fulfill the main task, experts in genetics, pediatrics, nutrition, etc. as well as scientists in the field of sport and physical education, sociology, demography, etc. were invited in order to establish a fruitful dialogue, between basic and applied science. A special perspective of the dialogue planned is an analysis of the many-sided variations in human physique, including body composition. Another feature of the Symposium is multidisciplinarity: colleagues from various fields will be reunited from various regions of the world around a common theme, growth and physique.

Our Symposium was organized in the year of the Hungarian millecentenary. The first Magyar settlers of Hungary came into the Carpathian Basin at least 1100 years ago. The Hungarian history there in the last eleven-hundred years has not been easy, in fact, it was rather bloody. We can say with our poet:

„És annyi balszerencse közt,
oly sok viszály után,
megfogyva bár, de törve nem
él nemzet e hazán."

„...and amid so much misfortune,
and so much discord,
although diminished but not broken,
the nation lives in this country."

(Szózat - Appeal to the Nation = Second Hungarian National Anthem, written by Mihály Vörösmarty in 1836).

This wonderful poem also mirrors our hope in a better future.

Also the town Veszprém which has received the Symposium in a nice place, has also its own history. Veszprém was the residence of the Hungarian Queens. Beside of the house of the Veszprém Committee of the Hungarian Academy of Sciences where the Symposium has its sessions, statues of St. Stephen, the first king of Hungary and his Wife, Beatific Gisella of Bavaria stand and remind us... (The relic of Beatific Gisella, her right humerus, returned from Passau, Germany, just a few weeks earlier and during the Symposium it is in the Cathedral, which is the next-door building.)

The Bisdom of Veszprém (today Archbisdom) was founded exactly 1000 years ago, in 996. It is true enough that the walls in Veszprém Castle respire history.

At the three and a half day Symposium 16 countries (Austria, Belgium, Canada, Czech Republich, Croatia, Estonia, France, Germany, India, Italy, Poland, Slovenia, Spain, U.K., U.S.A., and Hungary) are represented. Twenty-nine foreign speakers (plus five accompaning persons) and 38 Hungarian participants are present. During six sessions, 42 papers will be presented. In the last day, we intend to organize a round-table discussion on body composition, moderated by Professors W.D. Ross and W. A. Stini. The sessions must be very stimulated. Out of the 42 papers, 24 will be given by foreign and 18 by Hungarian colleagues. Five papers will be presented by young colleagues.

The material of the Symposium will be published in the Hungarian journal „Anthropologiai Közlemények".

During the Symposium nice social events will be organized, too: A concert, followed by a reception given by the County Veszprém; a half-day excursion to Balatonfüred, taking a walk on the shore of the Lake Balaton, visiting the memorial of the Indian poet Rabindranath Tagore, then leaving for Tihany by boat. In Tihany in the Abbey church an organ concert is foreseen, after it wearting the tomb of the Hungarian King I. András in the undercraft on the church, afterwards a banquet in a „Csárda". A closing reception will be given by the Town Veszprém.

After the Symposium, the First Hungarian-Indian Workshop of Auxology will be organized in the same place. The Indian and Hungarian colleagues will have an occasion to know eachother better, to discuss their recent research results, etc. It is planned to create a tradition, followed by the Indian-Hungarian Workshop of Auxology, organized by the Indian colleagues, probably in Patiala, India.

The Organizers have taken steps to ensure that your stay in Veszprém will be as pleasant as possible. We hope that your visit in Hungary will be rewarding both from scientific as well as social points of view, and that it will strenghten and perfect bonds between human biologists and other scientists of bordering fields.

My special thanks are due to Dr. Pál Győri, the Secretary of this Symposium for his valuable and many-sided help in organization of our Symposium.

Our best wishes for a successful Symposium!

Anthrop. Közl. *38;* 5-9. (1996/97)

FACTORS RELATED TO SKELETAL AGE IN NORMAL SCHOOL-BOYS

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Abstract: *Several studies (Nicoletti et al. 1978, Benso et al. 1980, Vignolo et al. 1992) indicate that in italian normal children skeletal age is advanced by 0.3 to 0.7 years with respect to Tanner charts. In this note, we examine some factors which may affect bone maturation of a set of 681 normal school-boys aged from 6.5 to 12.5 years. Data have been collected between 1977 and 1978 in the framework of the PACT survey (Programma Antropometrico per la Citta di Torino) based on a random 2-stage sample of primary and secondary schoolchildren in Turin. Instruments and techniques used to measure auxometric traits were those recommended by the Department of Growth and Development of London University. All left hand-wrist X-rays were rated by the same assessor according to the TW2 method. RUS bone age appears to be advanced by about 0.5 years in the whole period under study, while the advancement of carpus bone age is more prominent (0.6 years) in boys aged under 9. Bone age (20-bones) is delayed by 0.4 years in boys whose height is lower than the 25th centile of Tanner charts, and advanced by 1.2 years in boys whose height is above the 75th centile. The onset of puberty does not seem to affect bone maturation. In boys with BMI (body mass index) below 15.0 (25th centile) bone age is close to chronological age, while in boys with BMI above 17.5 (75th centile) bone age is advanced by 0.9 years (RUS) and 0.6 years (carpus). The correlation between BMI and bone age could explain in part the advancement of bone maturation of italian children, whose BMI values are slightly higher than those of the coeval boys participating in the Harpenden growth study (16.5 versus 16.1)*

Key words: *skeletal moturation, TW2 bone age, height, weight, BMI.*

Introduction

Several studies (Nicoletti, Cheli, Cocco, Salvi and Socci 1978, Benso, Corradetti, Fabio, Passone, Pastorin, Rota and Stasiowska 1980, Vignolo, Milani, Cerbello, Coroli, DiBattista. and Aicardi 1992) indicate that in the Italian normal children and adolescents skeletal age is. higher than chronological age by 0.3 to 0.7 years, on the average.

This finding is usually related to the difference in the mean age at the onset of puberty ,and at the age at peak height and weight velocity, between the Italian children and the subjects participating in the Harpenden study, from whom TW2 scoring method was derived (Tanner, Whitehouse, Marshall, Healy and Goldstein 1975, Tanner, Whitehouse, Cameron, Marshall, Healy and Goldstein 1983).

This note aims at assessing to what extent RUS (radius, ulna, short bones) and carpus maturation is related to some factors, such as sexual maturation, height growth and body mass index, in a set of normal boys.

Subjects and methods

In the framework of the *Programma Antropometrico per la cittá di Torino* (PACT survey, Benso et al. 1980) 681 normal boys aged from 6.5 to 12.5 years were included in a random 2-stage sample of primary school children and of the first class of secondary school children in Torino between 1977 and 1978 . In the first stage 10 % of classes were selected, and in the second stage 20% of the children were taken from each class selected.

Instruments and techniques used to measure auxometric traits were those recommended by the *Department of Growth and Development of London University* (Cameron 1986). Conventionally, a testicular volume equal to 4 ml or more was regarded as a sign of puberty. All left hand-wrist X-rays were rated by the same assessor according to the TW2: radius, ulna and short bones (RUS) and carpus (CAR) were analysed separately.

Results

The difference TW2-RUS age *minus* chronological age shows a range (-3.2 to +4.0 years) wider than the range of the difference TW2-CAR age *minus* chronological age (-2.9 to +3.3 years). Between 10 and 12 years, pubertal children show values of TW2-RUS age slightly higher than the prepubertal children of the same age, but no difference is apparent as regards. TW2-CAR (Figure 1, top). In prepubertal boys the advancement of bone age tends to decrease with increasing age, with the only exception of a peak at the age of about 11 years: this peak is steeper for RUS (+0.72±0.15 years, *mean±standard error*) than for carpus (+0.41±0.14). The difference TW2-RUS age *minus* TW2-CAR age ranges from -2.4 to +3.4 years. Before puberty, the difference in bone age between RUS and carpus increases rather regularly with age: from -0.25±0.10 to +0.45±0.14 years (Figure 2, left). The advancement of RUS maturation over carpus maturation is particularly apparent in pubertal boys 10 years old (0.64±0.18 years).

Boys whose height is above the 75th percentile of Tanner-Whitehouse norms (1976) show a remarkable advancement of bone age, for both RUS (from 1.19±0.28 to 1.70±0.18 years) and carpus (from 1.24±0.24 in boys aged 7 to 1.45±0.18 in boys aged 12). Boys with height below the 25th percentile show a slight delay of bone maturation, for both RUS (from -0.15±0.27 to -0.84±0.22) and carpus (from -0.22±0.17 to -1.32±0.12, if we omit the value at the age of 7 years). Boys whose height is within the interquartile range are in intermediate position also for bone maturation (Figure l, centre). In boys of the same age, differences in height growth do not seem to be correlated with differences in maturation between RUS and carpus (Figure 2, right). Height growth is related to RUS and carpus maturation to the same extent: we observe an average difference of 1.62±0.11 years between boys above the upper quartile of hSDS distribution and boys below the lower quartile (Table 1, top)

Table 1: Mean differences skeletal age minus chronological age and RUS minus CAR age (years) in PACT boys, classified by quartiles of height-SDS distribution (top) and Body Mass Index distribution.

Height SDS:	**<25th** N=152	**25th - 75th** N=346	**>75th percentile** N=183
TW2-RUS age	-0.39 + 0.08	+0.47 + 0.06	+1.23 + 0.08
TW2-CAR age	-0.53 + 0.08	+0.33 + 0.05	+1.09 + 0.07
RUS - CAR age	+0.14 + 0.06	+0.14 + 0.04	+0.14 + 0.06

Body Mass Index:	**< 15.0 kg/m²** N=162	**15.0-17.5 kg/m²** N=348	**l>7.5kg/m²** N=171
TW2-RUS age	+0.09 + 0.09	+0.46 + 0.06	+0.90 + 0.09
TW2-CAR age	+0.08 + 0.09	+0.33 + 0.06	+0.60 + 0.09
RUS - CAR age	+0.01 + 0.06	+0.13 + 0.04	+0.30 + 0.06

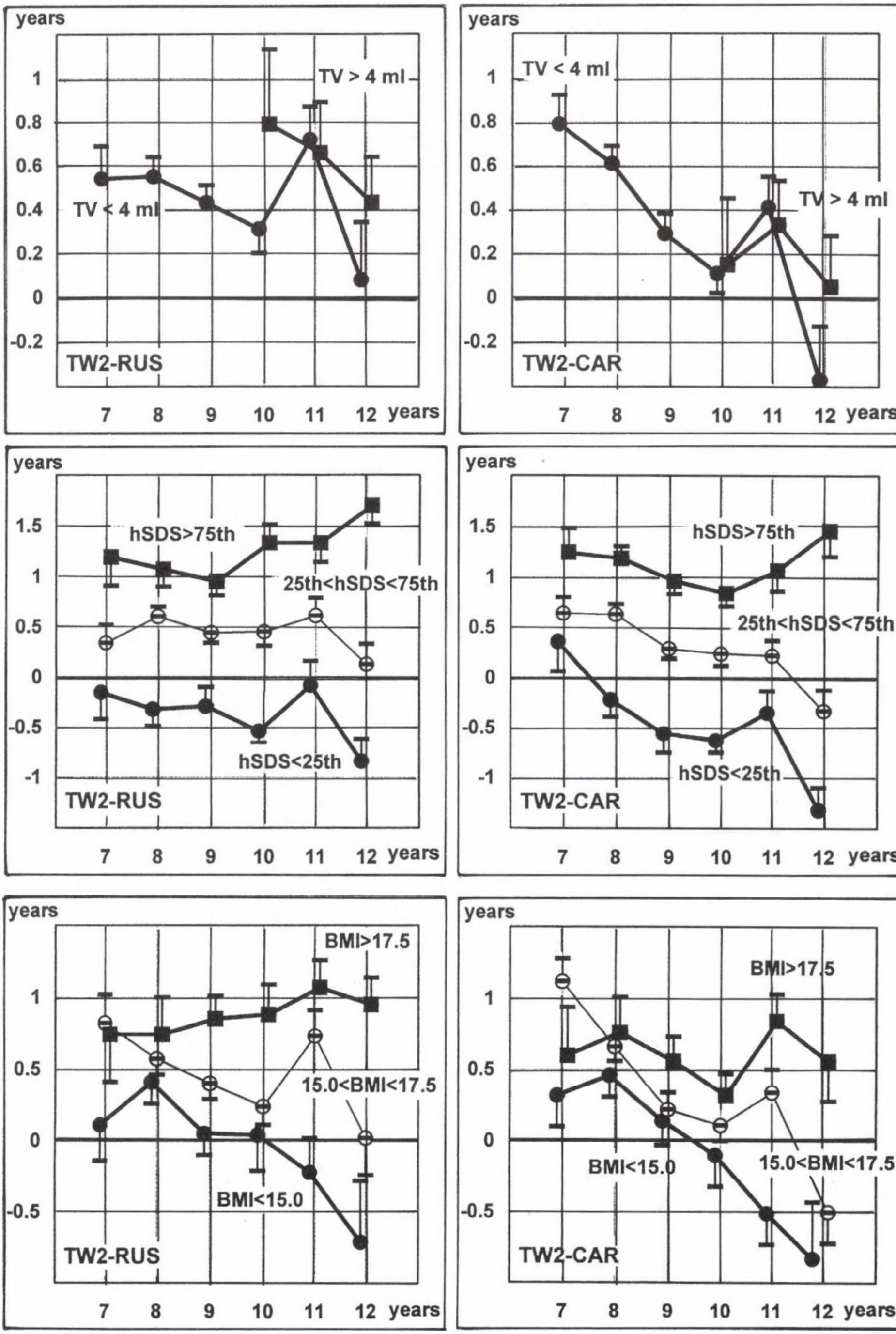

Fig. 1: Mean differences skeletal age minus chronological age (standard error) as a function of chronological age (years), in PACT boys classified by testicular volume (top), quartiles of height-SDS distribution (centre) and quartiles of Body Mass Index distribution (bottom).

Boys whose BMI is higher than 17.5 kg/m^2 (the *75th* percentile of BMI distribution in the PACT sample) show a consistent advancement of bone age, for both RUS (from 0.74±0.33 in boys aged 7 to 0.95±0.19 years in boys aged 12) and carpus (from 0.60±0.34 to 0.56±0.28). Boys with BMI lower than 15.0 kg/m^2 *(25th* percentile) show a delay of bone maturation only after 10.5 years of age. In boys 12 years old, delay values are -0.71±0.44 (RUS age) and -0.83±0.40 (CAR age). Generally, boys with BMI in the range 15.0-17.5 kg/m^2 are in intermediate position also for bone maturation (Figure 1, bottom). Bone maturation is related to BMI more for RUS than for carpus: between boys above the upper quartile and boys below the lower quartile we observe an average difference of 0.81±0.13 years for RUS age and of. 0.52±0.13 years for CAR age (Table 1, bottom). In this regard it should be noted that BMI is not completely independent of height-SDS: hSDS is -0.18±0.07 in boys below the lower quartile of BMI distribution and +0.44±0.08 in boys above the upper quartile. Nevertheless, this little difference in hSDS may account for only a part of the correlation between BMI and bone age: in particular, the difference between RUS age and CAR age appears to be related only to BMI.

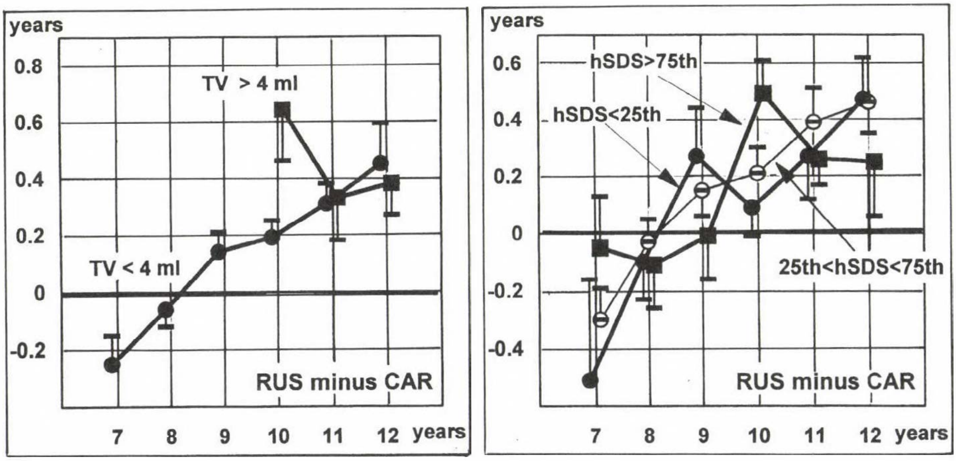

Fig. 2: Mean differences RUS minus CAR age (standard error) as a function of chronological age (years), in PACT boys classified by testicular volume (left) and quartiles of height-SDS distribution (right).

Comments

The above results cast further shadows on the belief that bone age may be considered *tout-court* a proxy of biological maturation. The first reason is that sexual maturation, which is the main marker of *tempo* of growth, is not strictly related to skeletal maturation: these two aspects of biological maturation are not necessarily synchronous (Benso, Vannelli, Pastorin, Angius and Milani 1986). The second reason is that a delay in bone maturation is often recorded in children whose height growth follows a low percentile. We must remember that a short child may be a case of growth delay as well as a short individual. In PACT sample, final height was known in 70 subjects: the advancement of skeletal age was

0.11±0.30 years (RUS) and 0.11±0.24 years (carpus) in subjects whose final height was below the *25th* percentile, whereas it was 0.94±0.32 years (RUS) and 0.74±0.40 years (carpus) in subjects whose final height was above the *75th* percentile! The third reason is that BMI is associated with bone maturation. Though boys with high BMI tend to be also more mature and slightly taller than slim boys, body weight was found to be related to bone age even in children of the same age, height and pubertal stage.

The above considerations not only should constitute a warning against a loose use of the.concept of skeletal maturation in clinical practice, but also should raise some doubts on the role of bone age in the prediction of adult height.

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Anthrop. Közl. *38;* 11-15. (1996/97)

VARIATION IN PATTERNS OF HUMAN GROWTH: A CONCEPT OF THE STRATEGY OF GROWTH

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Abstract: *The main purpose of this paper is to provide an insight into some aspects of the theoretical auxology. A concept of the strategy of growth as a unique interaction between genotype and environments the developing organism meets in the course of its individual life. The individual strategy may be recognised phenotypically as a non-standardised pattern of growth. The intrinsic and extrinsic causal factors of the unique genotype by environment interactions are involved in a model of growth in quantitatively varying metric traits. The model is a compilation of two traditional approaches: that of quantitative genetics (genes and environments) and that of developmental biology (epigenetic factor). Empirical data supported the theoretical framework derives from the Poznań Growth Study of longitudinal design. The sample consists of 284 boys and 270 girls born in 1980, aged between 5 and 14 years and growing up within the three levels of SES: high, medium and low. Individual growth curves are plotted with the use of nonstructural approach where the residuals are smoothed by Fourier estimation. The number and intensity of minigrowth spurts depend on the timing, intensity and duration of environmental factors operating on the developing organism. The tendency of growth is presented in terms of a linear regression equation. The results obtained indicate that environmental factors do not favour any specific strategy of growth; despite of the environmental factors all theoretically assumed strategies of growth are presented.*

Key words: *Genotype; Environmental factors; Interaction; Individual strategy of growth.*

Introduction

One of the properties of a living organism is its ability to changes. This tendency is well visible in the course of individual life. It is known that a human being like all animals begins its life as a single cell, the fertilised ovum. Equally, it passes through all the stages of its development in predetermined sequence in some environments. The transformation of an organism from one developmental stage to another is the result of a unique interaction between its genes and the environmental milieu the developing organism meets in the course of its life. It is evident, that every individual has his/her own history of life and pattern of growth and development. Searching for the most plausible explanation for the mechanism of developmental changes several methodological attempts are undertaken. The present study has the ambition to be one of them. The main purpose of this study is to provide a theoretical framework for a concept of the individual strategy of growth and its empirical exemplification.

Material and methods

The material consists of individual growth patterns in body height of children born in 1980. They have been participants in the Poznań Growth Study, since 1985 (Kaczmarek 1995). The sample under study consists of 554 subjects e.g. 284 boys and 270 girls aged between 5 and 14 years. The Longitudinal design of the project includes monitoring of the children's growth within social classes of the society. Standing body height were measured semi-annually with the use of the GPM anthropometer and with acceptable accuracy

(Cameron 1984) . The socioeconomic status (SES) was chosen as representative for environmental factors. According to the rank of a single social variable, high (A), medium (B) and low (C) levels of the SES were distinguished. High level of SES was assessed if both parents have academic education, one child, provide the best financial and dwelling conditions, medium level of SES was assessed if both parents have secondary education, two children and the medium possibilities of financial and dwelling support of the family. Low level of SES was assessed if both parents have primary or vocational education, more than three children, they provide the worst financial and dwelling conditions of life.

Individual curves of growth in height were plotted with the use of the procedure proposed by Jolicoeur, Pontier, Abidi (Jolicoeur et al. 1992). The JPA2 procedure is based on the assumption previously pointed out by Robertson, that human growth in metric traits may be distinguished as some additive, more or less independent phases of growth. In the described model three phases of the continuous growth are distinguished: early childhood, middle childhood and adolescence. The JPA2 model is a seven parametric asymptotic mathematical formula. The goodness of ft of this model over the investigated range of age was good: the mean square error averaged 0,58 cm in boys and 0,52 cm in girls. Despite of the good fit of the JPA2 model to measurements of height, the average residuals in each yearly interval were not everywhere zero, showing that the model had some bias. Both the size of the root mean squares and the sign of the patterns in the residuals indicate the presence of some remaining systematic variation. It reveals some evidence for waves of slightly accelerated or decelerated growth often lasting one or two years (minigrowth spurts) during middle childhood. These deviations from the main trajectory of growth reflects the individual strategy of development which is adequate to interactions between genotype and environmental factors.

Results

A concept of the individual strategy of growth

It is well known that the sequential ordering and timing of specific events in the course of the individual life cycle are controlled and regulated by factors recognised as four major categories: intrinsic genetic, epigenetic, maternal genetic and extrinsic environmental factors. Showing the maternal genetic factor, it is emphasised at the same time that mammalian, as well as human, development is under the control of two separate genomes: maternal and progeny. Extrinsic environments where human being completes its activities are recognised as: uterine, nursing and postweaning. Environmental factors may act generally or specifically by modifying genetically programmed pattern of growth and size and shape of morphological structures. The four categories of causal factors of development are related either by interaction or by determination. They constitute elements of the model for human growth and development (Figure 1). The model is a compilation of two traditional approaches: that of quantitative genetics (genes and environment) and that of developmental biology (epigenetic factor). It seems that this model is adequate for better understanding of the relative roles of the intrinsic and epigenetic control and regulation of growth and development. Genetic (endogenous) control of development is possible due to the fact that the progeny genome provides the blue-print for development. This does not mean that genes directly influence the shape of a particular morphological structure. They may rather act locally (intrinsically) by coding for structural or regulatory elements or regulating their expression and activities. They may also act epigenetically (extrinsically) to influence the activities of cells at a distance (hormone regulation). There are non-heritable conditions which may have a significant impact on development. Environmental (exogenous) factors may blur the contribution of genetic and heritable epigenetic factors to the development within the reaction norm of genotype.

A concept of the individual strategy of development refers to an adaptable „responses" of the growing organism to various environmental stresses. The most likely mechanism of this „responses" seems to be multiple; it depends on the specific relation between susceptibility of the genotype to various environmental factors (genetic flexibility) and the epigenetic regulation of growth. The result of this unique genotype by environment interaction may be phenotypically recognised as a non-standardised pattern of growth.

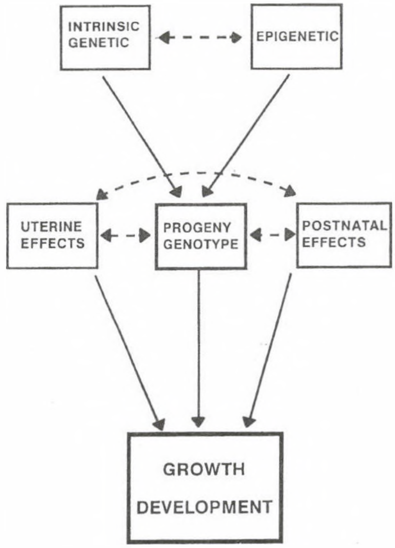

Fig. 1: A quantitative genetic model of metric trait development

Individual strategies of growth within the different level of SES

It is also perfectly clear that body height is particularly prone to nutritional and environmental influences. Environmental control of the growth pattern is tend to be verified within the range of socioeconomic conditions (Bielicki 1986)

Individual strategy of development is shown by example taken at random from the whole sample. Distance and velocity curves were plotted against the age with the use of the nonstructural methodological approach. The JPA2 procedure used in combination with Fourier analysis of residuals emphasised the short time variation in the preadolescent pattern of growth. In the next step, the tendency of growth was assessed according to the equation of linear regression. This made possible to characterise the periodicity of growth as being monotonically directional (positive or negative) or fluctuating.

Girl 166 lives in a family with medium SES (Figure 2).

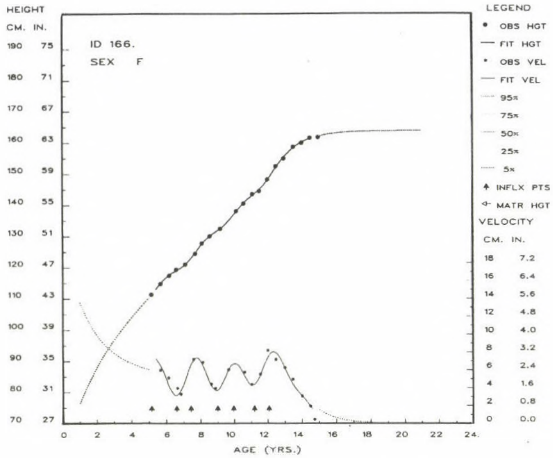

Fig. 2: Girl no 166 from a family with medium level of SES :
distance and velocity curves (nonstructural model, Fourier estimation of residuals)

The distance curve is at the 50, which means that the status of growth is perfectly average. Velocity curve indicates that the tempo is rather slow, since it is at the position of 25 percentile. The adolescent growth spurt in height begins at age 8.80 yrs (only two months later than on average) and the velocity at this time (MPP) is 5.01 cm/yr. PHV begins at 11.96 yrs and its intensity is lower than average - 6.70 cm/yr. The total adolescent increment is 33.11 cm and attained height is 163.90 cm, slightly smaller than at average. Nonstructural velocity curve indicates as many as 7 short term growth spurts at various ages and intensity which are responses of the organism to environmental stresses. There is a tendency for negative (N) pace of growth in body height in this girl. The negative tendency indicates that growth in body height undergoes on monotonically lower developmental levels in the subsequent stages of individual life.

The distribution of the individual tendencies in growth expressed in terms of the linear regression within each level of SES indicate that environmental factors do not favour a definite strategy of growth. All theoretically possible strategies were presented in the sample under study within high, medium and low level of SES.

Discussion

Considering complex characters or patterns such as height or growth it is clear that they imply the interaction of many factors. Therefore, normal variability within a population for those characters is typically assumed to result from additive polygenic inheritance and environmental factors which make some contribution to the variation. Although it is a clear evidence for high heritability of body height, environment plays an important role in modifying genetically programmed course of growth. The status and rate of growth are found to be the most sensitive indicators of environmental impacts on growth during childhood (Bielicki 1986, Tanner 1992, Hauspie et al .1995).

Socioeconomic status has equally important impact on growth and development but always as a secondary influence interacting with nutrition, health care, well being. The adequacy of the total quantity of food consumed is essentials for human growth (Kimura 1984, Susanne et al. 1987). It is accepted that the education of the parents are connected with eating habits and numerous other factors which affect growth and development of the child. Some authors have even shown that the status and rate of development depends more on psycho-social factors than on purely economic conditions (Tanner 1992).

Conclusions

The results of this study indicate a clear evidence for the diversity in individual strategies of growth which may be found phenotypically in the individual pattern of growth. This pattern is non-standardised and in the preadolescent period is characterized by short terms variation. The mechanism of the individual strategy of growth is assumed to be multiple and is found as the result of the specific relationship between genetic susceptibility to environmental factors and the regulation of growth by epigenetic factors. As development proceeds in different environments interacting with genotype, it seems that the conceptual model of factors determining processes of growth is adequate for better understanding of the mechanism responsible for biological differences between social classes.

It seems that findings of the studies postulated pulsatile or cyclical nature of growth can approximate this problem even better (Ashizawa, Kawabata 1990, Lampl et. al 1992, Hermanussen, Burmeister 1993)

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Anthrop. Közl. *38;* 17-22. (1996/97)

BODY SIZE IN CHILDREN WITH CONGENITAL HYPOTHYROIDISM

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Abstract: *In 1995, the Italian Study Group for Congenital Hypothyroidism (ISGGH) undertook a multicentre survey (18 centres) involving the retrospective collection of endocrinological and growth profiles of 844 subjects (580 girls and 264 boys) with congenital hypothyroidism (CH), and born between 1957 and 1995. In this note body size and proportions at diagnosis of 111 patients (83 girls and 28 boys) detected between 2 and 36 months of age are compared with Italian norms for children up to 3 years. In children with GH, spontaneous growth of body length was found to be impaired more (-2.03±0.16 SDS, mean±standard error) than weight (-0.93±0.13 SDS) and head circumference (-0.26±0.15 SDS). This results in a disproportionate appearance which becomes more severe with increasing age: the difference between the SDS of height and head circumference was larger than 2 in 9% of babies aged under 6 months and in 80% of children aged over 18 months. Mean adult height (available for 40 subjects) was 2.9±1.9 cm above the target in children diagnosed and treated before 6 months, and -3.3±1.3 cm below the target in children diagnosed after 18 months. These findings confirm the importance of screening tests for hypothyroidism at birth and immediate thyroid hormone replacement also to correct short stature in CH.*
Keywords: *Congenital hypothyroidism, lenght, weight, head circumference.*

Introduction

Congenital hypothyroidism (CH) is a pathology characterised by severe mental retardation, delay in skeletal and pubertal maturation, and growth impairment. Neonatal screening and early treatment with thyroid hormone replacement are known to prevent children with congenital hypothyroidism (CH) from abnormal development.

In Italy, where CH is observed in 4.1 newborn infants out of 10,000 (Giovannelli 1995), neonatal screening was introduced in 1978 and was extended to the whole country since 1992. In 1995, the Italian Study Group for Congenital Hypothyroidism (ISGCH) undertook a retrospective multicentre survey with the aim of evaluating skeletal maturation and somatic growth in CH children detected at birth by screening, and during infancy by signs and symptoms. Actually, most literature focuses on neurologic development of CH children, but relatively few are data on somatic growth, mainly as regards final height (Bucher, Prader and Illig 1985, Chiesa, Gruñeiro de Papendieck, Keselman, Heinrich and Bergada 1994; Boersman, Otten, Stoelinga and Wit 1996).

The aim of this note is to describe body size and proportions at diagnosis of CH children detected between 2 and 36 months of age, and the effects of late diagnosis and treatment on adult height.

Subjects and methods

Data here analysed come from the retrospective collection of endocrinologic and auxologic profiles of 844 CH subjects (580 girls and 264 boys) born between 1957 and 1995. Among these, 111 children (83 girls and 28 boys) were detected by signs and symptoms between 2 and 36 months of age.

Supine length, body weight and head circumference at birth were compared with the Italian neonatal charts (Bossi and Milani 1986, 1987), based upon sample of 16,336 neonates. Supine length, body weight and head circumference at diagnosis were compared with the Italian longitudinal norms for children up to 3 years (Cortinovis, Bossi, Milani 1993), based upon a sample of 10,414 reference infants measured at birth, and approximately at 3, 6, 9,12, 18, 24, 30 and 36 months of life. Final height was compared to final height of Tanner-Whitehouse norms (1976). Target height was defined as the midparental height decreased by 6.5 cm in girls, and increased by 6.5 cm in boys. Skeletal age at diagnosis was assessed, in most cases, by Greulich-Pyle atlas method (1959).

Standard deviation scores (SDS) were derived from the above standards as follows:

$$\text{SDS} = \frac{\text{child's size at age t} - \text{mean size at age t}}{\text{standard deviation at age t}}$$

In children aged under 3 years, the distribution is approximately Gaussian not only for supine length and head circumference but also for body weight: therefore SDS values have Gaussian distribution for all these auxometric traits.

Results

In our sample CH neonates are similar to normal neonates for gestation age (mean = 40.0 weeks, SD =1.3 weeks), but are slightlý heavier. In CH neonates mean birthweight is 3396 g (SD = 515 g) for girls, and 3608 g (SD = 698 g) for boys; in normal at-term neonates mean birthweight values of 3319 g (girls) and 3475 g (boys) are reported (Bossi and Milani 1986). On the average, birthweight is appropriate for supine length (difference weight-SDS minus length-SDS: -0.09±0.19, mean±SE), whereas head circumference is slightly disproportionate (difference head circumference-SDS minus length-SDS: +0.44 ±0.22).

In untreated CH girls and boys, growth of length appears to be affected progressively with age: at 2 months most of babies are below the 50th percentile of the Italian norms, and all children aged over 18 months are below the 3rd percentile (Figure 1, top). In untreated CH girls and boys, growth of weight appears to be less impaired than growth of length, in any case most of children aged over 18 months are below the 10th percentile (Figure 1, centre). As a result, untreated CH children show too high values of weight for length. This disproportionate appearance becomes more severe with increasing age: the difference between the SDS values of weight and length (W-L-SDS) is larger than 2 in 4% of babies aged under 6 months and in 37% of children aged over 18 months (Figure 2, left).

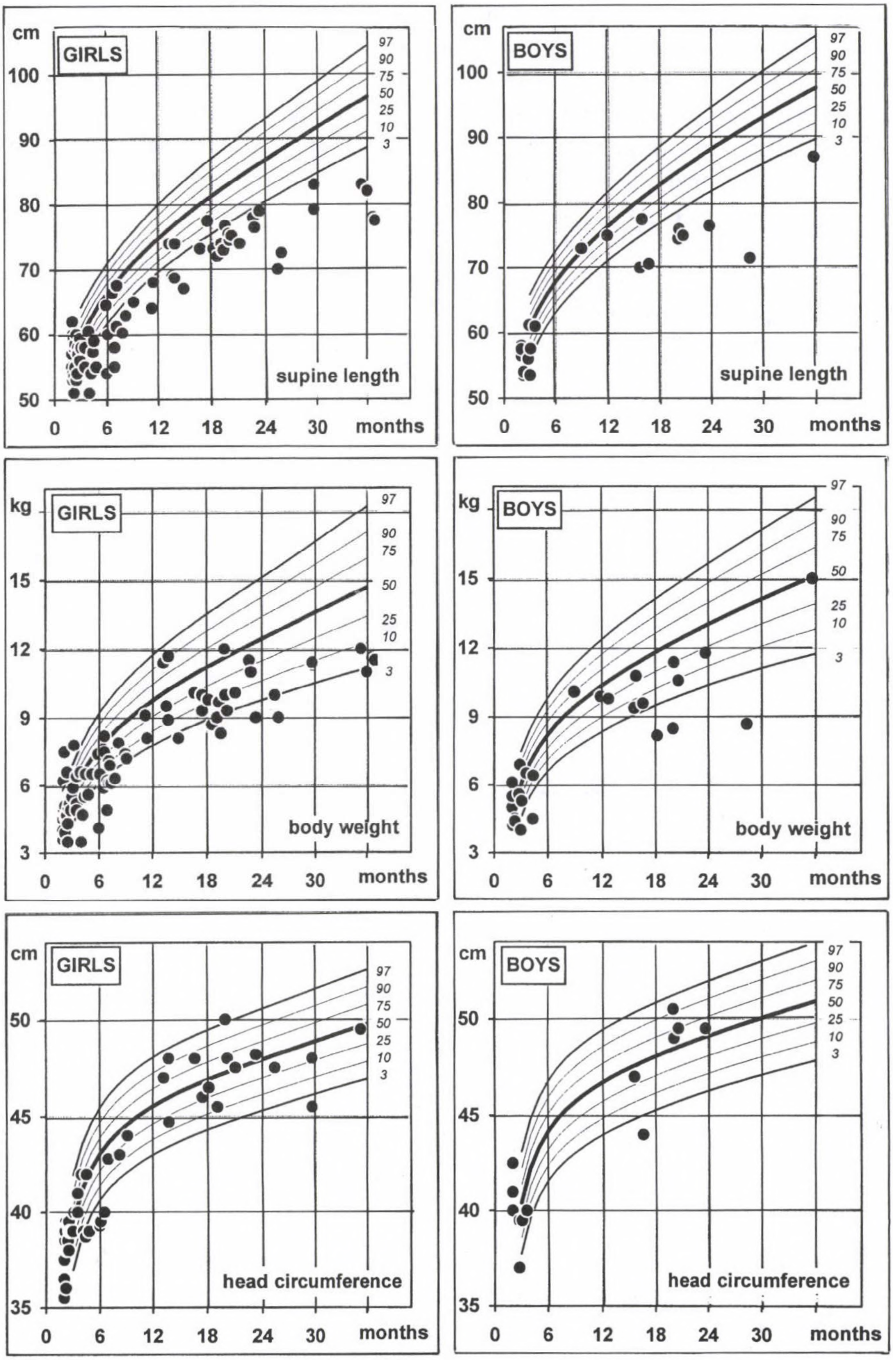


Fig. 1: Supine length (top), body weight (centre) and head circumference (bottom) at diagnosis in CH children (dots), compared with Italian longitudinal norms for children up to 3 years (continuous lines)

In this regard, is useful to recall that under assumption of proportionate growth, only 0.7% of children are expected to show a W-L-SDS larger than 2, the standard deviation (conditional on sex and age) of the differences W-L-SDS being equal to 0.82. Therefore the frequency of CH children with W-L-SDS larger than 2 is from 6 (under 6 months) to about 50 (over 18 months) times higher than the frequency expected in the case of proportionate growth. On the other hand, only 8% of children show negative W-L-SDS values, the expected frequency being 50%.

In untreated CH children aged up to 3 years, growth of head circumference does not seem different from that of normal children (Figure 1, bottom). For this reason, untreated CH girls and boys show too high values of head circumference for length. This disproportionate appearance becomes more severe with increasing age: the difference between the SDS of head circumference and length (H-L-SDS) is larger than 2 in 9% of babies aged under 6 months and in 80% of children aged over 18 months (Figure 2, right). Under assumption of proportionate growth, only 2.9% of children are expected to show an H-L-SDS larger than 2, the standard deviation of the differences H-L-SDS being equal to 1.06. Therefore the frequency of CH children with H-L-SDS larger than 2 is from 3 to about 30 times higher than the expected frequency. Only 9% of children show negative H-L-SDS values.

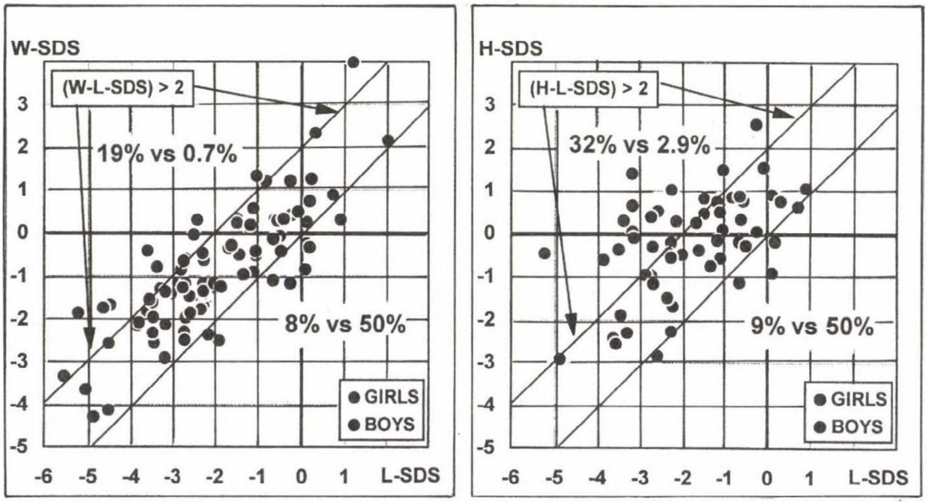
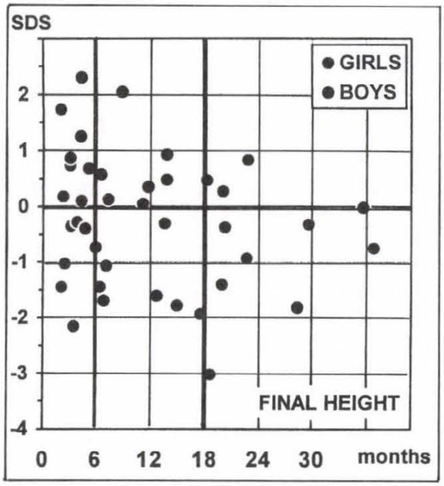


Fig. 2: Relationship of weight SDS (W-SDS, left) and head circumference-SDS (H-SDS, right) to supine length SDS at diagnosis in CH children
The children with W-SDS (or H-SDS) lower than L-SDS are represented by the dots below the lower oblique line. The children with W-SDS (or H-SDS) higher than L-SDS by 2 SDS are represented by the dots above the upper oblique line

Skeletal age at diagnosis, available for 27 children only, appears to be delayed by 0.94±0.14 years with respect to chronological age. In particular, in the 14 children diagnosed after the 18th month, skeletal age is delayed by 1.49±0.42 years.

Late diagnosis and therapy are related to low final height (Figure 3 and Table 1).



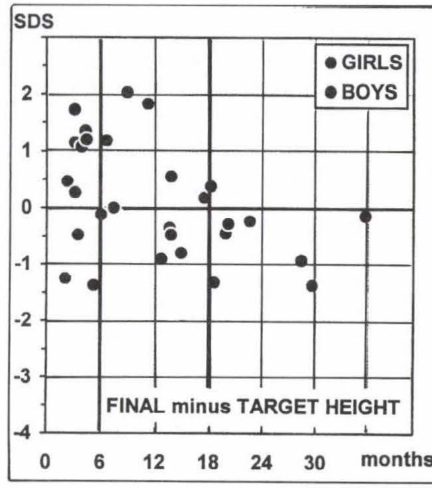


Fig. 3: Relationship of final height-SDS (left) and difference final height-SDS minus target height-SDS to age at diagnosis (right)

Table 1: Mean final height and mean difference between final height and target height (expressed as SDS) in CH children

Age at diagnosis	Final height SDS N	Final height SDS mean±SE	Final minus target height SDS N	Final minus target height SDS mean±SE
under 6 months	15	+0.10±0.31	12	+0.45±0.30
6 to 18 months	14	-0.38±0.33	10	+0.32±0.33
over 18 months	11	-0.64±0.34	8	-0.54±0.22
all children	**40**	**-0.27±0.19**	**30**	**+0.14±0.19**

Out of the 29 CH subjects detected within 18 months of age, 15 have achieved a final height above the average adult height. By contrast, only 3 out of the 11 subjects diagnosed after the 18th month show final height above the average (Figure 3, left). This result does not depend on differences in target height between children diagnosed within the 18th month and those diagnosed after the 18th month. As a matter of fact, when the difference final height minus target height is taken into account, it emerges that 13 out of the 22 CH subjects detected within the 18th month show final height greater than target height, whereas only 1 girl among subjects detected after the 18th month went beyond her target.

Comments

Neonatal data reported above indicate that CH and normal newborn infants are similar for length of gestation as well as for body size and shape, although in CH neonates head circumference tends to be slightly too large with respect to crown-heel length. This finding indicates that during intrauterine life thyroid hormones have mild effects on somatic growth, while are essential to the normal neurologic development.

During infancy, height growth of untreated CH subjects is affected more severely than weight and head circumference growth. The growth damage leads to a disproportionate shape, which becomes more and more apparent with increasing age. Of course, the age at the beginning of the treatment with thyroid hormone is not the only factor which affects somatic growth of CH children: type of diagnosis (agenesis, ectopic gland, hypothyroidism with gland in place) and its correlation with the severity of hormone deficit, concomitant congenital anomalies, type of drug administered (extract of dry thyroid gland or L-thyroxine), dosage and patient's compliance may have a not negligible role. In any case, early diagnosis and adequate treatment with thyroid hormone may prevent CH children from impairment of growth, while a belated intervention may result in a final short stature.

The results here outlined confirm the importance of screening tests for hypothyroidism at birth and immediate thyroid hormone replacement as regards not only psychological and intellectual maturation, but also somatic development

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Anthrop. Közl. *38;* 23-31. (1996/97)

SOCIO-ECONOMIC STATUS AND STATURAL GROWTH IN BASQUE POPULATION

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Abstract: *This research has examined the statural growth of a cross-sectional sample of 3782 students aged between 4+ and 24+ from the Basque Province of Biscay, fitting the observed height data to the PB1 (Preece-Baines Model 1). Individuals, who did not belong to extreme socio-economic groups, were classified, according to the profession of their fathers, into two groups: the higher social classes (SES1) and the working class (SES2). The standardised residuals from a whole sample growth model by sex were studied to analyse the socio-economic effects on the height-for-age attained, but the differences observed between the social classes over the period of growth were not significant. Secondly, the research has covered a specific fit of the growth model from socio-economic subsamples in order to analyse the effect of the social class on the derived biological parameters of the PB1. In both sexes, in comparison to SES1 the working class starts and reaches the summit of the growth spurt with a certain degree of delay. Although PHV is greater in SES2, at the beginning and ending of the growth spurt the SES1 sample overtakes in velocity of growth the SES2 and, as a consequence, the SES1 sample reaches a higher adult height.*

Key words: *Cross-sectional growth study; Stature; Socio-economic effects; PB1 model.*

Introduction

The growing organism is a part of the human ecosystem, influenced therefore by socio-economic factors. These factors depend on the size and character of the social environment (urban or rural), the system of values and the organisation of each society (traditions and customs, food consumed, way of life, sports, hygiene, means of transport, infrastructure of housing states and so forth). Some of the socio-economic factors which have influence on human growth are familial related (Wolanski, 1988), i.e., on one hand the level of education and culture of the parents, and the immediate environment, exerts an influence on diet, hygiene or sports and, on the other hand, the earnings in proportion to the number of persons supported have influence on food consumption, type of housing and hygienic conditions. Most of the socio-economic factors are often shared by social groups or by sub-populations defined by ethnicity or geography. In fact, in some countries rural-urban differences in child growth can be attributed to specific socio-economic conditions (Clegg, 1982).

Class-related differences of growth have also been diminishing in many of the developed countries, phenomenon which can be considered as an achievement of a top for secular trend in stature (Lindgreen, 1976; Roberts, 1977). Secular trend in industrialised countries is decelerating and no amount of environment amelioration will generate appreciable gains (Tanner et al, 1982). Nowadays, the gradient of income and family living conditions are more similar among social classes, but some countries preserve a substantial gradient of family income and, consequently, differences in child growth among their social classes (Bielicki et al., 1981; Shephard et al., 1984). Mascie-Taylor and Boldsen (1985) provide information to prove that a contemporary British sample population of 11 year old boys and girls had stature distribution more differentiated by social rather than regional reasons. In general, children living under better socio-economic conditions precede in growth and maturation to their counterparts living under worse conditions. This phenomenon (hysteroplasia) has been noted by Eiben (1989) in Hungary, being the educational level of the parents (both of them) the most remarkable factor in the social background.

In several American studies that take into account the ethnicity of the sub-populations, socio- economic factors also contribute to growth differences found among ethnic groups (Schutte, 1980). The influence of the socio-economic environment over people who move to better zones shows the importance of better living conditions to achieve gains in statural growth (Wheeler and Poh Tan, 1983). However, in some developed countries height could not be the most sensitive dimension to socio-economic effects, since there seems to be, between farmers and professionals, more differences in widths than in body lengths (Olivier, 1970).

Some samples do not show a social stratification of the stature because they are themselves rather homogeneous as far as socio-economic differences are concerned (Orban-Segebarth et al., 1982). In those groups family size, rather than income or father's profession, could reveal stature stratification. In Belgian families it has been found a negative relation between stature and size of the family, relation which increases in poor environments (Freese et al., 1986).

Our research deals with the analysis of the possible effect, on human stature during the growth period, of the socio-economic environment in a cross-sectional Basque sample. Although the sample had a rather homogeneous socio-economic background (most of them middle class) and there were not any marginal groups included, our research focus on the study of the extent of the possible differences in height-for-age and timing of growth among the socioprofessional classes present in the sample.

Method

The cross-sectional sample consisted on 3, 782 individuals, aged from 4+ to 24+ years, from the province of Biscay in the Basque Country. The decimal age for each individual was computed as the difference between the day of sampling and the day of birth. The stature was obtained using the Weiner and Lourie (1981) protocol for anthropometric measures.

The father's profession of each individual was recorded in an interview. Other studies employ the father's profession as a way of defining socio-economic conditions (Olivier, 1970; Mascie-Taylor and Boldsen, 1985). This method can be considered as a good summary of the social conditions because it relates them with educational level, income, size of the family and other familiar characteristics with ecological significance. However, this method could have practical drawbacks from the fact that some subjects would not clearly express the father's profession. Farmer, for example, could be intended as owners or workers. In order to avoid such drawback we have included accurate questions. Besides, the father's profession has been reduced to two categories: SES1 and SES2, using the protocol prepared by the Villa de Bilbao Council for the census of 1990. The categories comprised the following target groups in the census:

SES1: 1.- Professionals.
2.- Managers.
3.- Administrative employees and enterprise clerks.

4.- Merchants and shopkeepers.
5.- Farmers and fishermen.
SES2: 6.- Specialized workers.
7.- Not specialized workers.

The sample did not include marginal groups. A previous study had showed that Biscayan farmers and fishermen from the same area were not the lower category in height-for-age due neither to income or to living conditions (Rosique, 1992). The SESl category therefore comprises the professions of the middle and upper classes of the Biscayan sample, whereas the SES2 category comprises the working class of the sample. The standardised height-for-age value of each subject in the sample was computed as the residual of its actual height from the mean predicted value that affords the fit of the Preece Baines Model 1 (PB1) to the whole sample divided by sex. The Preece Baines Model 1 (PB1) has been applied to the scatter plot of points without reducting data to age intervals. The Model was fitted by using the NRL module of the SPSS/PC+ up to achieve the minimum value for the RSS (Residual Sum of Squares). The RSS from the fits of males and females were compared by using the SEE. Moreover, a One-way Analysis of Variance was performed from the individual standardised values of height-for-age, in order to compare subjects' height of SES1 and SES2.

The socio-economic subsamples have also been studied to test the possible differences in timing of growth by means of the biological parameters the PB1 is able to yield. That is why specific socio- economic models of growth have been obtained from both SESl and SES2. The analysis comprises the following implementations:

1.-PB 1 was fitted separately for the subsamples SES1 and SES2 divided by sex.

2.-The velocity curve was obtained from the first derivative of each equation and the biological parameters were worked out from the curves. Finally, the differences in parameters were analysed. As a consequence of the former, the results were arranged into two general parts: the first one covers a study of the residuals from the whole sample model of growth and, the second one, studies the derived biological parameters from the specific socio-economic status model of growth.

Results

The whole sample model of growth

Table 1 shows the number of individuals, mean, standard deviation and ranges of age for the whole sample divided by sex.

Table 1: Descriptives for age by sex

	n	Age M±DS	Age ranges
Males	1860	14.14±3.78	4.17 -24.53
Female	1922	14.38±3.68	4.31 -24.32

The fit of the PB1 yielded the following equations for the whole sample:

$$h=174.61-(2*(174.61-162.72)/e(0.11*(t-14.13))+e(0.94*(t-14.13))$$ males

$$h=162.02-(2*(162.02-152.26)/e(0.14*(t-11.91))+e(1.04*(t-11.91))$$ females

Figure 1 displays the plot of distance and velocity curves. After the fitting, a RUNS test was performed to verify whether the residuals were biased or not, but no significant deviation was found neither among males or females. The SEE for each equation, the RUNS test, the parameters of the distance curves with the obtained standard errors and the derived biologic variables are shown in Table 3.

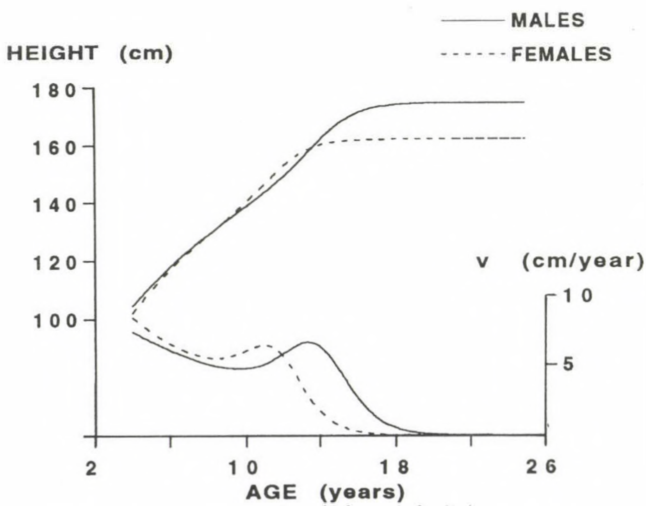

Fig. 1:. Plot of the fit of PB 1 to the whole sample divided by sex, showing the fitted distance and velocity curves

Standardised Height-for-age for each subject in the whole sample model was submitted to a One-way analysis of variance in order to study the differences between the SES categories in attained height (Table 2). As Bartlett-Box F test showed, groups had homoscedasticity. The F ratio could not show heterogeneity between categories, so we concluded that subsamples were not different in attained height-for age.

Table 2: Results of the ANOVA for the standardised height by socio-economic status

ANOVA (One way)	SES1(n)	SES2(n)	Bartlett-Box F	d.f.	F ratio
Males	859	955	0.001	1, 1812	2.53
Females	791	1069	0.076	1, 1858	2.26

Abbreviations: the F ratio test, the Bartlett-Box F did not yielded significant results

The specific socio-economic status (SES) model of growth

The fit of the PB1 yielded the following equations for males:

$$h=175.36-[2*(175.36-162.44)/e^{(0.10*(t-14.00))}+e^{(0.83*(t-14.00))}] \text{ SES1}$$

$$h=173.87-[2*(173.87-162.65)/e^{(0.11*(t-14.16))}+e^{(1.07*(t-14.16))}] \text{ SES2}$$

And the following for females:

$$h=162.42-[2*(162.42-151.07)/e^{(0.13*(t-11.60))}+e^{(0.84*(t-11.60))}] \text{ SES1}$$

$$h=161.82-[2*(161.82-152.60)/e^{(0.15*(t-12.04))}+e^{(1.16*(t-12.04))}] \text{ SES2}$$

Figures 2 and 3, for males and females respectively, display the plot of distance and velocity curves. A RUNS test did not show significant bias of the residuals. The SEE for each equation, the RUNS test, the parameters of the distance curves with the obtained standard errors and the derived biologic variables are shown in Table 3.

Table 3: SEE, RUNS test, parameters obtained for distance curves and derived biological variables for the sample as a whole and divided by socio-economic status

	Total sample		**Males**		**Females**	
Function parameters	**Males**	**Females**	**SES1**	**SES2**	**SES1**	**SES2**
h_1	174.61	162.02	175.36	1753.87	162.42	161.82
	±0.44	±0.21	±0.69	±0.56	±0.37	±0.26
h_Φ	162.72	152.26	162.44	162.44	151. 07	162.60
	±0.58	±0.73	±1.09	±0.68	±1.81	±0.82
s_0	0.11	0.14	0.10	0.11	0.13	0.15
	±0.01	±0.01	±0.01	±0.01	±0.02	±0.01
s_1	0.94	1.04	0.83	1.07	0.84	1.16
	±0.08	±0.10	±0.10	±0.13	±0.12	±0.15
Φ	14.13	11.91	14.00	14.16	11.60	12.06
	±0.13	±0.17	±0.23	±0.15	±0.38	±0.19
SEE	6.83	5.35	6.80	6.79	5.39	5.34
RUNS	NS	NS	NS	NS	NS	NS
Derived biological variables						
Adult height(cm)	174.61	162.02	175.36	173.87	162.42	161.82
Age at take-off (years)	9.75	8.37	9.14	9.99	7.89	8.75
Height at take-off (cm)	137.10	131.25	134.53	138.99	128.13	132.67
Velocity at take-off (cm/years)	4.93	5.41	4.92	4.44	6.09	5.40
Age at peak velocity (years)	13.34	10.99	13.06	13.59	10.05	11.28
Height at peak velocity (cm)	157.54	146.59	156.48	158.77	141.59	147.69
Peak height velocity (cm/year)	6.72	6.39	6.50	6.99	6.40	6.64

Discussion

The values of the SEE show that, in general, female models fit data better than male ones (Table 3), since all over the growth period female statures have a lower dispersion around the means than male statures. Moreover, although differences in SEE are really low

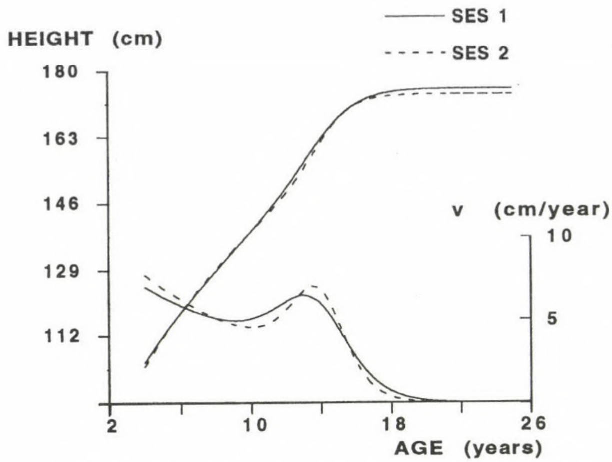

Fig. 2: Plot of the fit of PB1 to the male sample divided by socio-economic status, showing the fitted distance and velocity curves

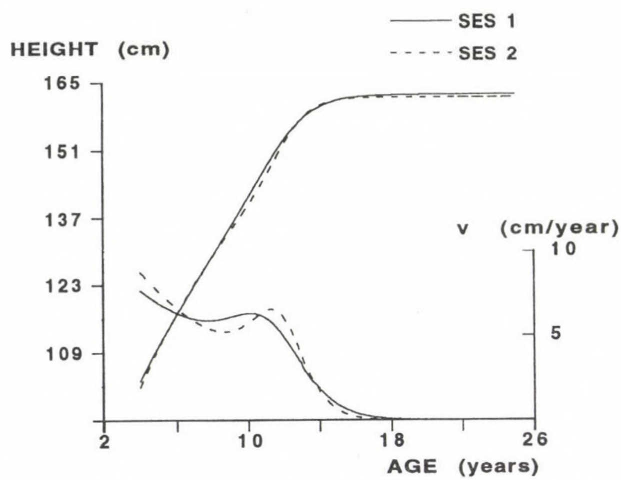

Fig. 3: Plot of the fit of PB1 to the female sample divided by socio-economic status, showing the fitted distance and velocity curves

between socio-economic categories, the SES2 subsamples have a tendency to fit better and show lower dispersion when compared to the SESl subsamples within each sex. Although SEE were acceptable the parameters in the model suffer the effect of every cross-sectional study in relation with longitudinal ones, the main of which is the smoothing of the velocity curve. However, parameters are useful as a descriptive method to compare cross-sectional samples. Although in the Basque sample under consideration, different socio-economic status cannot influence significatively the individual's height over the growth period, as F ratio test showed (Table 2), adult height (hl) in both sexes was higher in the upper classes (SES1) compared to the lower class (SES2), the working class. The former class reveals a more marked tendency in the male sample than in the female one, since differences in h_1 are greater in males. In fact Basque males could be more ecosensitive in adult height than females. In some European countries in which there is no relation between height growth and income a strong association between parent's profession and stratification of height was discovered (Massé, 1970). In our study final height rather than height along the growth period seems to be influenced by socio- economic status, although the effect of the family size should be studied in further researches, as other European studies do. In fact Freese et al. (1986) did not found significant differences in height among children of different socio-economic classes in Belgium, but verified an inverse relation between size family and standard height and weight.

The differences between sexes in the derived biological variables obtained (Table 3) afford an overall measure of sex dimorphism (male minus female values). In our research, absolute values of the sex dimorphism of the working class were reduced in all parameters, in relation to the SES 1, except for the PHV (Table 4). In general, the lower class groups have less sex dimorphism due to the negative response of males to poor nutritional and care conditions, being females more stable in dimensions and physiological features in such conditions (Stini, 1979).

Table 4: Differences in the values of derived biological variables obtained (males minus females) after fitting with the PB1

Sex dimorphism	**Whole sample**	**SES1**	**SES2**
Adult height (cm)	12.59	12.94	12.05
Age at take-off (years)	1.38	1.25	1.24
Height at take-off (cm)	5.85	6.40	6.32
Velocity at take-off (cm/years)	-0.48	-1.17	-0.96
Age at peak velocity (years)	2.35	3.01	2.31
Height at peak velocity (cm)	10.95	14.89	11.08
Peak height velocity (cm/year)	0.33	0.10	0.35

Therefore, the socio-economic status influences not only adult height and sex dimorphism, but also the amount of the spurt and the timing of growth. The former can be prooved by studying the differences (SES1-SES2) showed in Table 5. In both sexes, the working class (SES2), starts and summits the spurt with delay (age at take-off and age at PHV) in relation to the upper classes (SES1) and, as a consequence, the height at take-off and the height at PHV are higher in the SES2. In the Hungarian sample studied by Eiben (1989) the spurt of the lower classes was also delayed, although the criterion considered in that case was the educational level. The earlier onset of the growth spurt related to a better socio-economic status observed in many European populations is in part a consequence of the earlier maturation of the individuals belonging to that status (Massé, 1970). Although it can be stated that there is an earlier onset of the growth spurt in the wealthier Basque social environments the genetic background and its interaction with socio-economic status should be controlled in further researches.

Summarizing the comparisons of the main characteristics of the two social groups it can be stated that the extent of the spurt is greater in the SES2 category (Figures 2 and 3), and could be viewed as a kind of catch-up growth, although it does not last as long as it does in the higher classes. The increase of PHV for the SES2, in both sexes, in relation to the SES1 could indicate that groups with less resources tend to have a quick and important spurt, though somehow delayed, and their living conditions do not allow the growth increase they need to reach the upper classes counterparts. At the end of the adolescence therefore, the velocity curve of SES2 remains below the SES1 category (Figures 2 and 3). The environmental conditions in which individuals from both sexes grow during childhood, could be displayed by studying the timing and velocity at take-off, which is higher for the wealthier sample with regard to the lower classes (Table 5). The earlier spurt and higher velocity of the SESl category could represent the effect of better socio-economic conditions on growth. However, such effects do not influence height so much all over the growth period, but only the adult height, regarding males in particular. Biological parameters for females differ more between the socio-economic levels, except in the case of adult height and PHV which, in males seem to be more influenced by the socio-economic level(Table 5).

Table 5: Differences in the values of derived biological variables obtained (SES1 minus SES2) after fitting with the PB1

Socio-economic effects	Males	Females
Adult height (cm)	1.49	0.60
Age at take-off (years)	-0.85	-0.86
Height at take-off (cm)	-4.46	-4.54
Velocity at take-off (cm/years)	0.4 8	0.69
Age at peak velocity (years)	-0.5 3	-1.2 3
Height at peak velocity (cm)	-2.29	-6.10
Peak height velocity (cm/year)	-0.49	-0.24

Acknowledgments: This work was partly supported by the UPV 154.310-EB 224/95 research project.

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Anthrop. Közl. *38;* 33–48. (1996/97)

TRENDS IN GROWTH OF BUDAPEST CHILDREN AND YOUTH BETWEEN 1929 AND 1995

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Abstract: *The aim of this paper is to identify and analyse directions and velocities of secular growth changes in Budapest youth in the interval ranging from 1929 to 1995. Data of six growth studies concerning 3-18 year old boys and girls were used for trend analysis by linear regression. Height, weight, sitting height, biacromial and bi-iliocristal width and chest circumference were the body measurements investigated. In general positive secular changes can be seen in all measurements during the period examined. These changes are most expressed in height, weight and biacromial width. Trends in different age cohorts show that increase of means is the most intensive around the current age of pubertal growth spurt. At the end of the 20th century positive secular trend seems to be halted in Budapest which can be explained by negative tendencies in the change of economical, social, hygienic, etc. factors of environment.*

Key words: *Secular growth changes; Trend; Body measurements; Environmental factors.*

Introduction

It is accepted among humanbiologists from decades that the reason of positive secular trend is that retardation which conceals the optimum evolved during phylogenesis disappears due to gradually increasing environmental factors and as a consequence phenotypic characteristics reach more and more the biological maximum (Véli 1967, 1972). The concept of environment is complex thus many factors (beside natural environment economical, social, emotional-psychic, etc. factors, all in all factors of environment created by human) must be considered when secular growth changes are analysed.

Secular growth changes were investigated in Hungary in the second half of this century by many authors (Bodzsár and Pápai 1994, Eiben 1988, G. Szabó et al. 1993, Gyenis 1997, Gyenis et al. 1993, Németh and Eiben 1997). Findings are similar: there was positive secular trend in the last decades among Hungarian children and youth living in different regions of the country.

From body measurements mainly height and weight are used for the analysis of secular growth changes, beside characteristics of sexual maturation.

At the end of the century it is worth to investigate and evaluate the secular growth changes of this century (Bodzsár and Susanne 1997). The purpose of this study is to analyse secular trend and the velocity of secular growth changes in some body measurements in Budapest children and youth during this century using results of earlier studies and the author's own investigation as well.

Material and methods

Results of six Budapest growth studies (all are representative for the capital) were used for the analysis (Braunhoffner 1930, 1934, M. Viola 1952, Eiben et al. 1971, Eiben et al.

1994, Németh and Eiben 1997). These data derived from the interval ranging 1929-1995. Braunhoffner collected data in 1929 on 40857 children and in 1935 on 38903 children. M. Viola examined children in 1952, Eiben et al. did it in 1969 (4859 boys and 5051 girls) and in 1984 as a part of the Hungarian National Growth Study, the "HNGS", Eiben et al. 1991 (2666 boys and 2598 girls). Németh and Eiben carried out the last investigation in 1994 and 1995 involving 2606 boys and 2471 girls. In the two formest researches 6-14 year old boys and girls, while in the others 3-18 year olds were involved.

Stature, body weight, sitting height, biacromial width, bi-iliocristal width and chest circumference were the body measurements selected for examination. Stature and body weight however, were the only two on which comprehensive analysis (concerning the whole interval mentioned above) could be done, because other measurements were not comprised in Braunhoffner's studies. Therefore these two measurements are discussed separately from the others. The other four measurements were included in the last three studies, thus the analysis of these body measurements were done regarding the 1969-1995 interval. These investigations has been carried out already using the same measuring techniques which are internationally accepted and recommended by the IBP (Martin and Saller 1957, Tanner et al. 1969).

To investigate secular growth changes and the tempo of changes in these body measurements mean values in both sexes and the different age groups were used. The mathematical method adopted was trend analysis by linear regression. The linear regression equations of means R^2 were computed separately for each age cohort (one year difference was between the consecutive age groups), for boys and girls and for every body measurement. Trends were investigated and are discussed here in each age cohort but for the sake of clear pictures only the most characteristic lines and equations are plotted on the diagrams. All means however, are reported in this paper.

Regression analysis comprises the test for that whether the regression line deviates from the horizontal one (which means that there is connection between the two variables examined.) Results of this test are mentioned as well using 5% significance level.

Results

Looking at Table 1 and 2 definite increase can be seen in height and in weight as well in all age groups and in both sexes in the interval investigated. There are some age cohorts (mainly among prepubescents) in which this trend is not unbroken, but these breakings do not modify relevantly the lines of trends. This comes to light clearly looking into trend lines and regression equations (Figure 1, 2, 3 and 4). Except weights of four and five year old boys and four year old girls coefficients of steepness are positive in every case, that is means increased during the interval investigated. These coefficients also show the velocity of changes. Values of coefficients for height are between 0.0683 and 0.1453 in the 3-7 year old boys, but there is not concrete direction in the change of values. However, there is continuing quickening in the increase of height in the consecutive age groups between 7 and 14 year old children, that is steepness increase from 0.1039 to 0.3477. Coefficients gradually decrease from the means of 14 year olds in the older age cohorts in the boys (to 0.1336).

Concerning girls coefficients of steepness of height increase between age of 4 and 13 years from 0.0631 to 0.2723. Then there is a dramatic decrease between the groups of 13-

18 year old adolescents to 0.1052. All trend lines differ significantly from the horizontal one.

Findings are similar in the case of weight. In the boys steepnesses decrease between groups of 3-5 year olds (from 0.0277 to -0.0049) then gradual increase can be found to the age of 14 years (to 0.2863) and fluctuating decrease to the means of 18 year olds (to 0.1489). R^2 of the equation of 6 year old boys is relatively small (0.4739). Trends are more unambiguous in the girls: coefficients increase between age of 4 and 13 years (from -0.0084 to 0.2287) and then decrease to the oldest age cohort to 0.0135. Trend lines are horizontal in the 5 year old boys and 4 year old girls.

Considering sitting height (Table 3) only for the last 25 years mean values generally increase in this interval in both sexes, but not so clearly like in the case of height and weight. There is slight fluctuating increase in the steepness of trend lines between age of 4 and 9 in the boys (between 0.0024 and 0.0503) and definite and strong increase between age of 9 and 15 (to 0.1315) then a strong decrease to the oldest age group to 0.0355 (Figure 5). R^2 is very small in the case of 4 and 5 year olds (0.0066 and 0.1342). Trend lines are horizontal in the 4 year olds.

The picture is rather different in the girls. Steepnesses increase with fluctuation between 3 and 18 year olds. The highest value is just of the 18 year old groups (0.0960, Figure 6). The 7 year olds have the lowest (0.0085) value. R^2 is very small in the case of 6 and 7 year olds (0.1554 and 0.1172). Trend lines are significantly horizontal in the 7 year olds.

Biacromial width shows definite increase during the last 25 years in all age groups and in both sexes (Table 4). The velocity of increase (Figure 7 and 8) increases as well (but not smoothly) between the age of 3 and 7 in the boys (a=0.0527 as the lowest and a=0.0907 as the highest coefficients) and between the age of 3 and 10 in the girls (a=0.0490 and a=0.0957). The increase is gradual up to the age groups of 14 year olds in both genders (at these age cohorts a=0.1130 in the boys and a=0.1141 in the girls). The tempo of increase gradually decreases in the older age groups in both sexes (to a=0.0648 in the 18 year old boys and a=0.0770 in the 17 year old girls). All trend lines differ significantly from the horizontal one.

Changes of bi-iliocristal width are not positive in every age group (Table 5), but in the most cases positive trend can be seen in the change of this measurement in both genders. Coefficients of steepness (Figure 9 and 10) fluctuate between -0.0110 (7 year olds) and 0.0309 (10 year olds) in the boys as well as between -0.0042 (4 year olds) and 0.0442 (14 year olds) in the girls. In the case of 14 year old boys this value is high too (0.0298). R^2 is small in the case of 7 year old boys (0.4096) and 4 (0.0810) and 18 (0.4831) year old girls. Trend lines of 6 year old boys and girls and 4 year old girls are horizontal.

Chest circumference shows negative growth changes between the age of 3 and 7 years in both the boys and the girls (Table 6). Coefficients of steepness (Figure 11 and 12) range from -0.0672 (4 year old girls) to -0.0023 (3 year old boys). In the older groups the tempo of increase is positive and fluctuates. Change is the quickest in the 12 year old boys (a=0.1607) and in the 18 (!) year old girls (a=0.1005). R^2 is relatively small in the case of 6 year old boys (0.5398) and very small in the 3 year old boys (0.0036). Trend lines of 3 and 7 year old boys are horizontal.

Table 1: Height of Budapest boys and girls in different growth studies*

Age group (years)	**Means of boys (cm)** 1929	1934	1952	1969	1984	1995	**Means of girls (cm)** 1929	1934	1952	1969	1984	1995
3	-	-	93.5	94.45	98.7	99.26	-	-	92.5	93.91	99.2	96.40
4	-	-	100.5	102.46	104.2	103.28	-	-	99.5	102.40	103.1	102.02
5	-	-	107.5	109.23	110.4	110.32	-	-	106.1	109.11	110.1	109.52
6	-	-	113.0	115.78	118.2	117.26	-	-	112.6	115.13	117.8	116.60
7	115.8	117.6	119.4	122.46	123.0	122.49	114.8	116.8	118.8	121.52	121.9	122.19
8	119.1	121.1	125.3	127.02	128.4	128.85	118.0	120.0	124.4	127.16	128.1	129.07
9	124.4	126.0	130.5	132.82	134.4	134.95	123.7	125.1	129.5	132.57	133.5	135.19
10	129.2	130.8	135.0	137.83	140.0	140.83	128.2	129.9	134.5	138.66	138.9	140.03
11	132.1	134.2	139.6	142.98	144.5	145.99	132.0	133.8	140.2	143.95	145.9	147.57
12	135.1	137.3	144.2	148.08	151.1	151.79	136.4	138.3	145.9	149.68	151.5	152.79
13	139.2	141.1	149.9	154.12	158.4	158.21	140.4	142.9	151.3	155.21	157.7	158.02
14	143.3	-	156.2	161.63	165.1	166.63	145.2	-	155.6	157.98	160.9	161.32
15	-	-	161.8	166.23	169.5	171.34	-	-	157.4	159.75	161.7	162.21
16	-	-	166.2	171.31	173.2	174.36	-	-	158.4	160.36	161.8	163.73
17	-	-	168.9	174.87	174.9	175.70	-	-	159.1	160.70	162.3	164.74
18	-	-	170.0	175.94	175.9	176.17	-	-	159.7	160.75	162.3	164.42

* 1929: Braunhoffner 1930
1934: Braunhoffner 1934
1952: M. Viola 1952
1969: Eiben et al. 1971
1984: Eiben et al. "HNGS" 1991
1995: Németh - present study

Table 2: Weight of Budapest boys and girls in different growth studies*

Age group (years)	Means of boys (kg)						Means of girls (kg)					
	1929	1934	1952	1969	1984	1995	1929	1934	1952	1969	1984	1995
3	-	-	14.3	14.36	15.1	15.43	-	-	14.1	14.28	15.1	14.34
4	-	-	16.5	16.65	16.2	16.43	-	-	15.9	16.44	15.7	15.67
5	-	-	18.5	18.75	17.8	18.63	-	-	17.8	18.93	17.8	18.50
6	-	-	20.1	21.30	21.1	21.04	-	-	19.9	20.88	20.9	20.94
7	21.2	21.6	22.8	23.94	23.4	23.55	20.6	21.0	22.2	23.01	22.0	22.85
8	22.7	23.4	25.1	25.87	26.4	26.78	22.1	22.6	24.7	25.64	26.0	26.92
9	25.2	25.8	27.9	29.31	29.6	30.63	24.6	24.9	27.6	29.21	28.8	30.54
10	27.4	28.3	30.4	32.27	33.5	35.25	27.0	27.9	30.3	32.38	31.9	33.99
11	29.1	30.0	33.0	36.88	37.0	39.52	28.9	29.9	33.9	37.04	37.2	39.43
12	31.2	31.8	36.3	39.80	42.1	44.25	31.8	32.3	38.4	41.28	43.1	43.43
13	33.6	34.3	40.4	44.05	47.7	48.01	34.5	36.0	43.7	47.34	48.3	49.27
14	36.3	-	45.6	50.53	54.1	55.06	38.5	-	48.3	50.92	51.1	52.93
15	-	-	51.3	54.28	59.8	59.90	-	-	51.2	53.31	54.1	56.63
16	-	-	55.8	60.38	63.5	65.50	-	-	53.6	54.05	55.2	56.50
17	-	-	59.4	64.57	66.4	67.12	-	-	54.8	55.42	55.9	57.62
18	-	-	62.0	66.83	67.5	68.84	-	-	55.8	55.78	54.7	57.02

* see Table 1

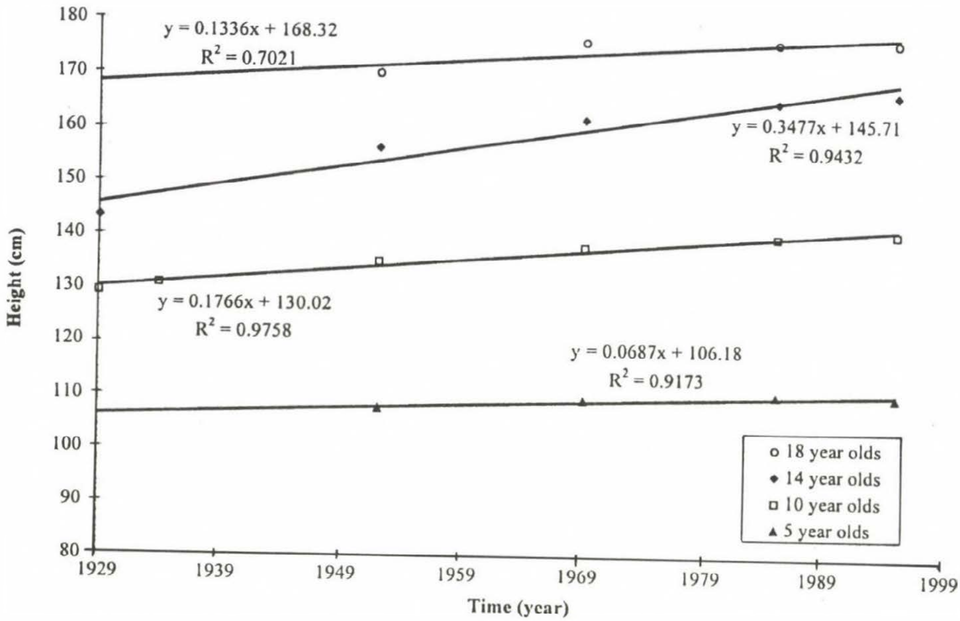

Fig. 1: Linear regression equations and trend lines for height of Budapest boys.

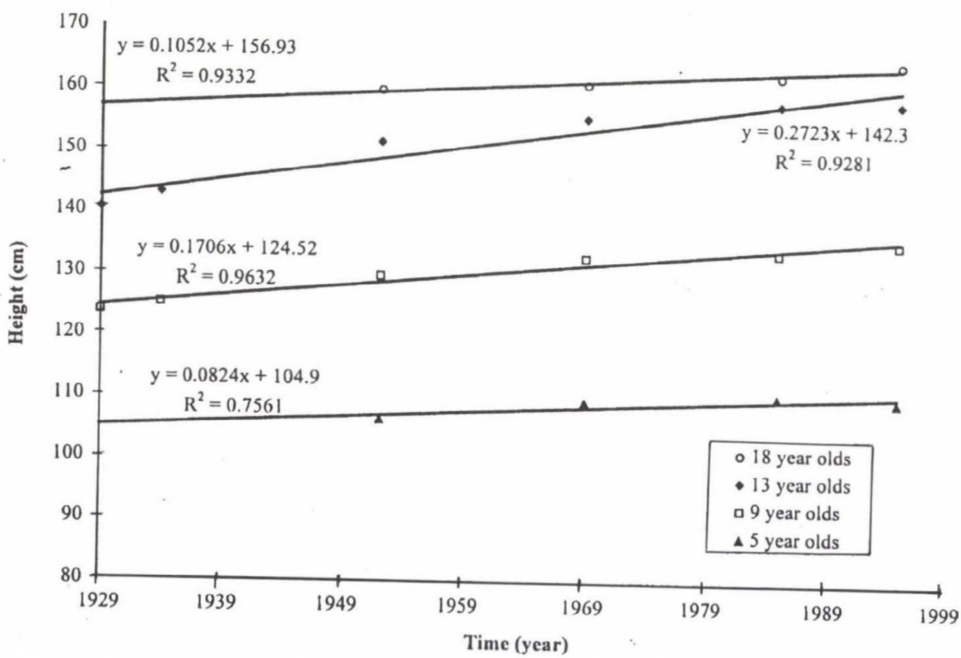

Fig. 2: Linear regression equations and trend lines for height of Budapest girls.

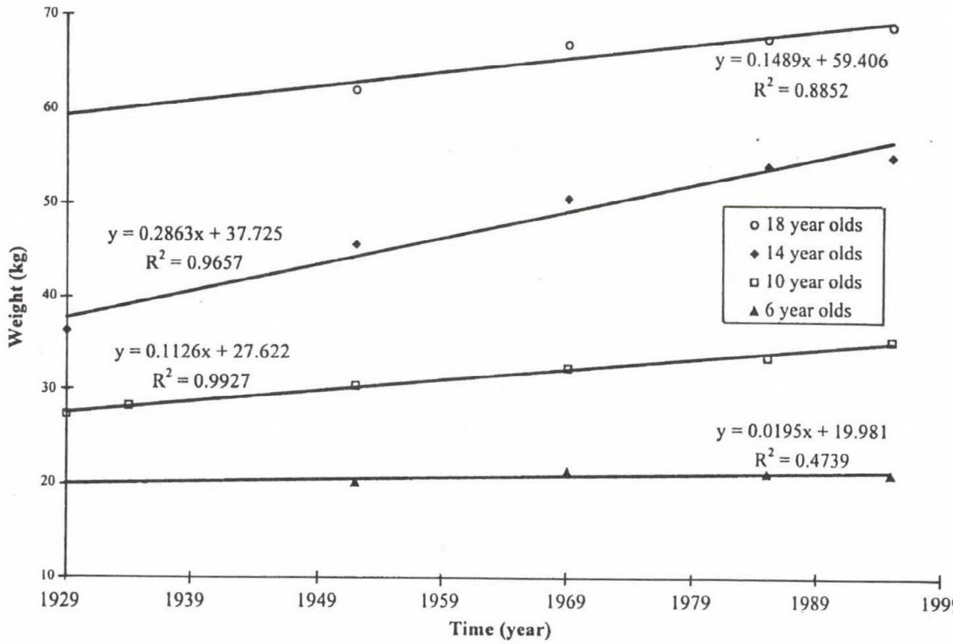

Fig. 3: Linear regression equations and trend lines for weight of Budapest boys.

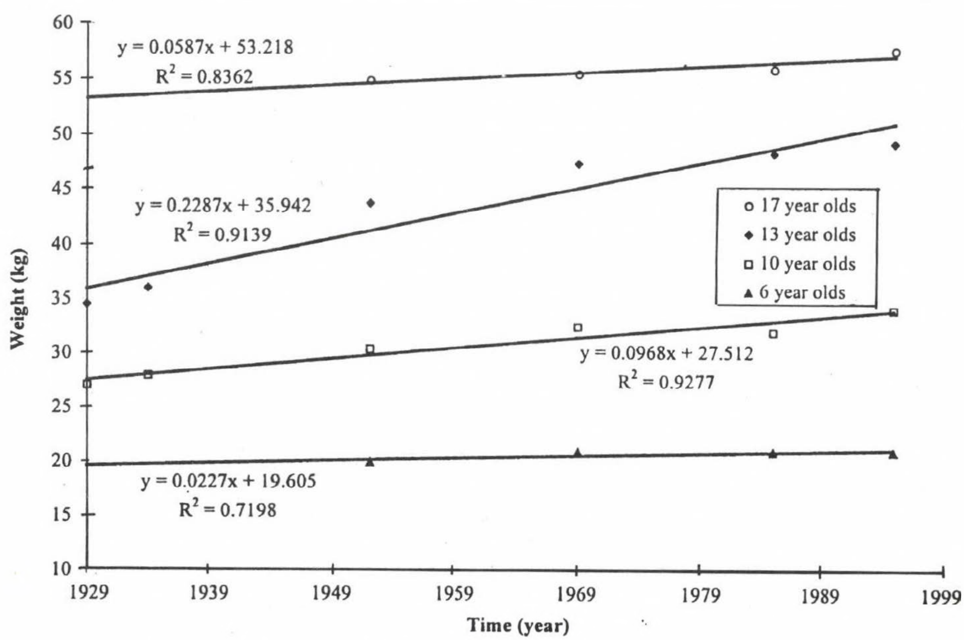

Fig. 4: Linear regression equations and trend lines for weight of Budapest girls.

Table 3: Sitting height of Budapest boys and girls in different growth studies*

Age group (years)	Means of boys (cm) 1969	1984	1995	Means of girls (cm) 1969	1984	1995
3	55.30	56.3	56.72	54.27	57.5	55.18
4	58.44	59.1	58.40	57.96	58.1	57.37
5	61.14	61.9	61.33	60.52	61.6	60.70
6	63.92	65.3	64.34	63.39	64.9	63.81
7	66.60	67.4	66.87	66.18	66.8	66.32
8	68.13	69.5	69.58	68.11	69.4	69.45
9	70.65	71.8	71.90	70.30	71.3	71.83
10	72.71	74.2	73.96	72.41	73.6	73.68
11	74.42	75.8	76.12	75.13	76.5	77.00
12	76.34	78.7	78.44	77.80	79.7	79.79
13	79.00	82.0	81.40	81.03	83.0	82.72
14	82.70	85.3	85.43	82.77	84.9	84.80
15	84.90	87.6	88.22	83.88	85.7	85.92
16	88.29	89.8	90.32	84.70	86.1	86.58
17	90.23	91.4	91.48	84.92	86.8	87.18
18	91.11	92.0	91.98	84.84	86.9	87.25

* see Table 1

Table 4: Biacromial width of Budapest boys and girls in different growth studies*

Age group (years)	Means of boys (cm) 1969	1984	1995	Means of girls (cm) 1969	1984	1995
3	21.34	22.6	23.73	21.31	22.3	22.76
4	22.58	23.4	24.33	22.55	23.0	23.88
5	24.00	24.0	25.63	23.83	24.1	25.43
6	25.08	25.8	27.01	24.98	25.9	26.89
7	26.74	26.8	28.24	26.30	26.9	27.83
8	27.62	28.0	29.57	27.36	28.3	29.49
9	28.70	29.2	30.91	28.30	29.3	30.85
10	29.70	30.4	32.13	29.30	30.7	31.81
11	30.81	31.6	33.37	30.70	32.1	33.18
12	31.67	32.7	34.51	31.80	33.5	34.41
13	32.79	34.4	35.67	33.04	35.0	35.63
14	34.85	36.1	37.88	33.54	35.7	36.45
15	36.42	37.6	38.98	34.42	36.0	36.83
16	37.96	38.8	40.50	34.75	36.3	36.91
17	39.06	39.5	41.21	35.09	36.4	37.08
18	39.84	40.0	41.67	34.73	36.3	37.08

* see Table 1

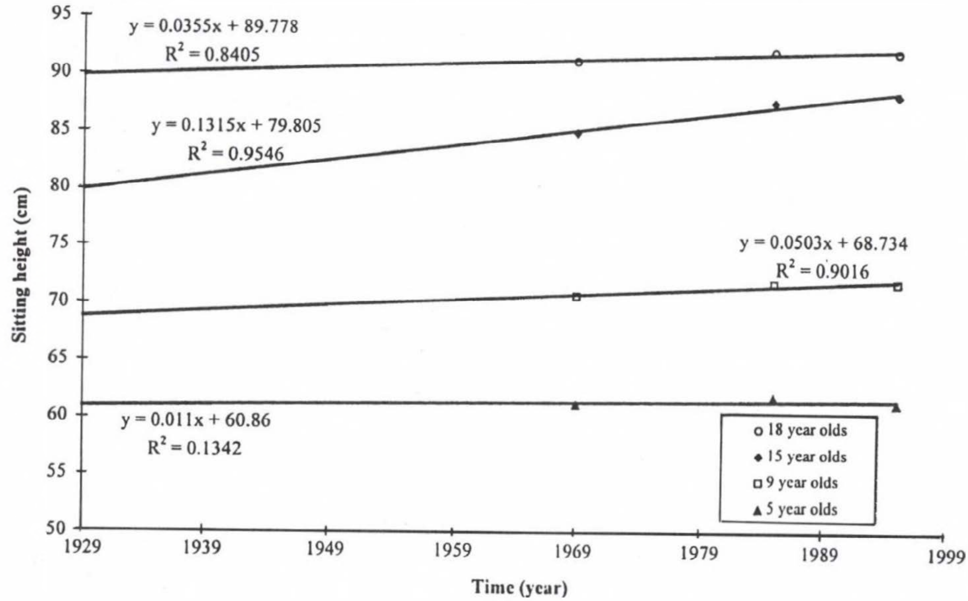

Fig. 5: Linear regression equations and trend lines for sitting height of Budapest boys.

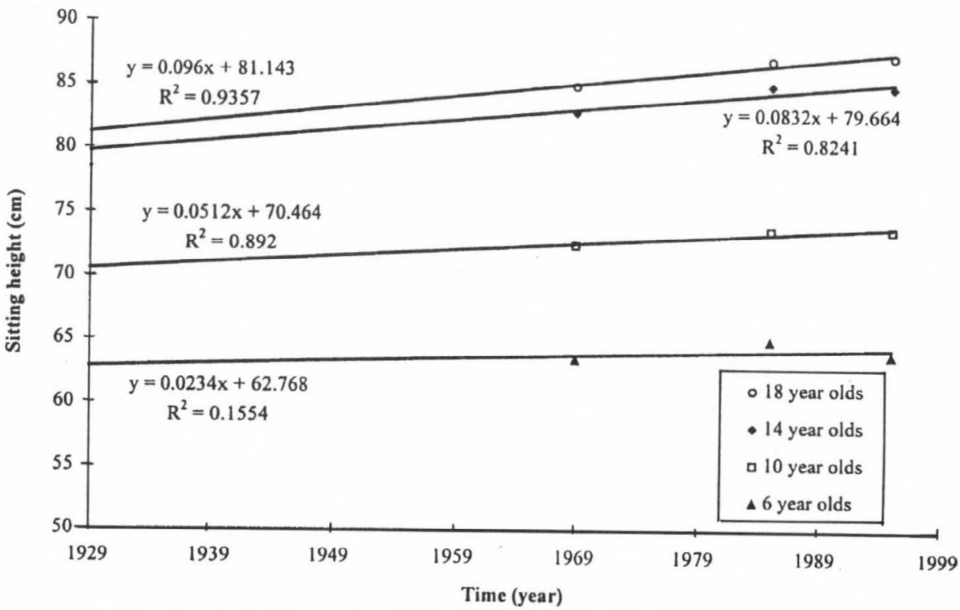

Fig. 6: Linear regression equations and trend lines for sitting height of Budapest girls.

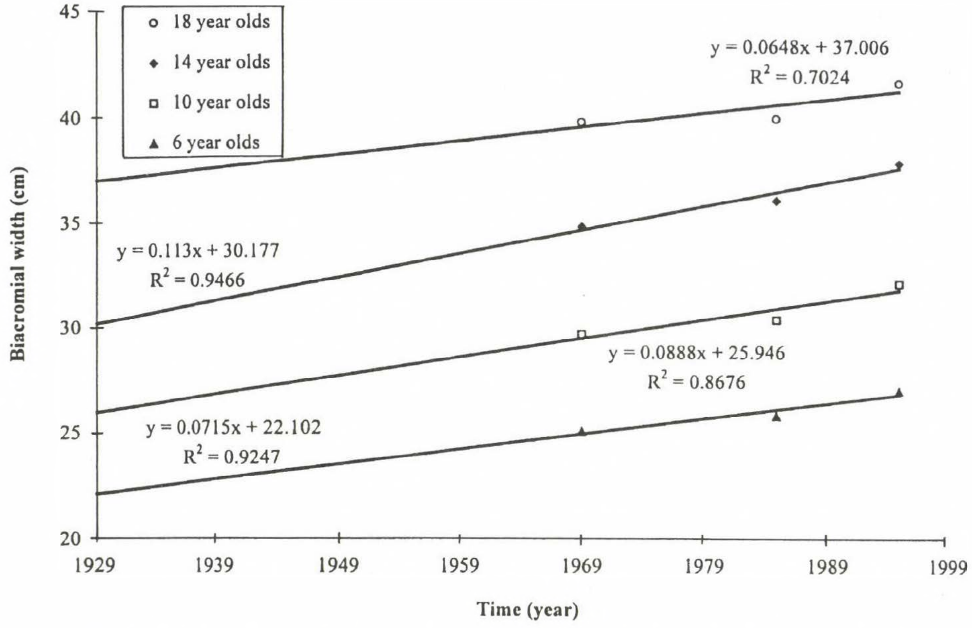

Fig. 7: Linear regression equations and trend lines for biacromial width of Budapest boys.

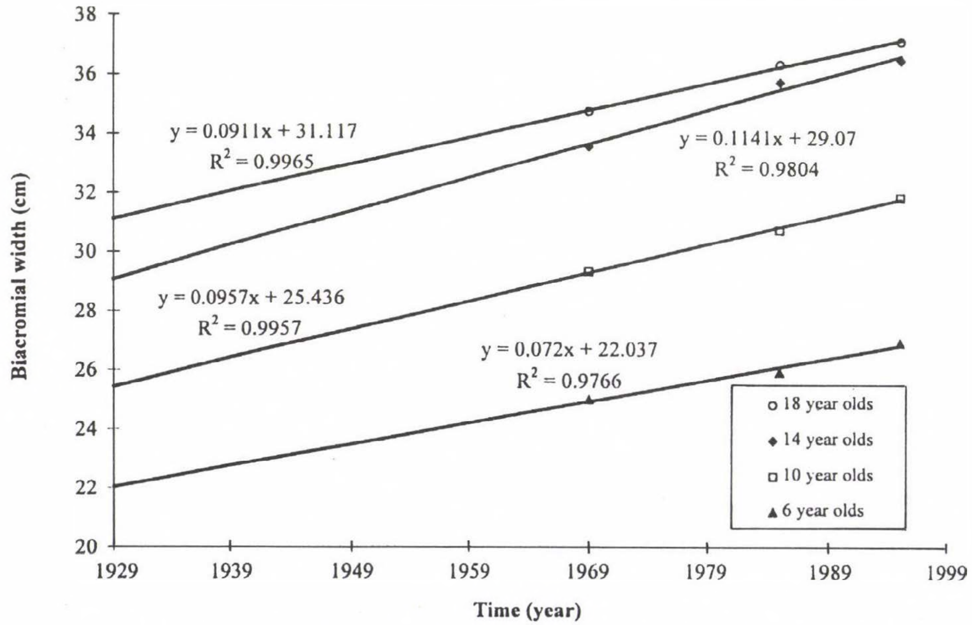

Fig. 8: Linear regression equations and trend lines for biacromial width of Budapest girls.

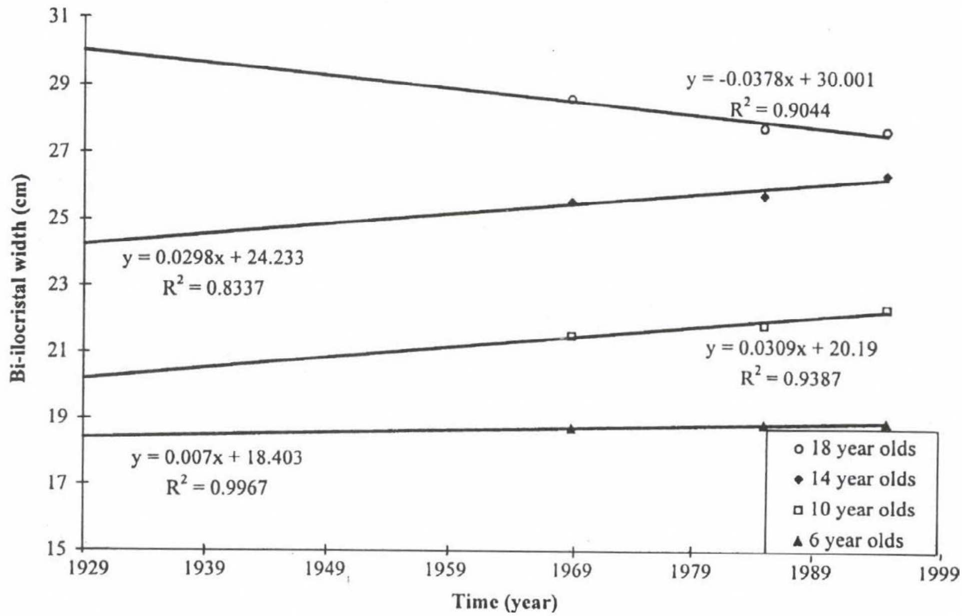

Fig. 9: Linear regression equations and trend lines for bi-iliocristal width of Budapest boys.

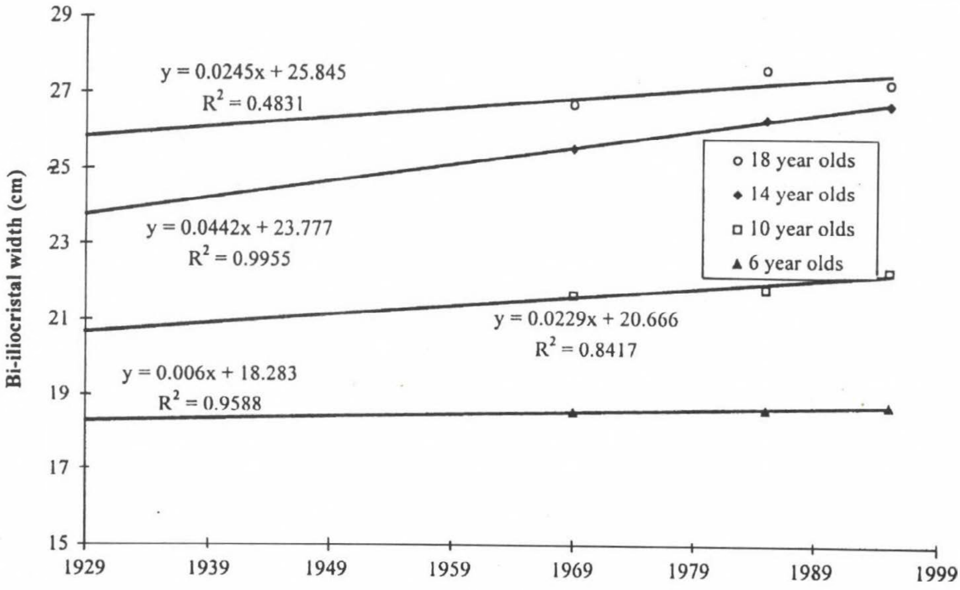

Fig. 10: Linear regression equations and trend lines for bi-iliocristal width of Budapest girls.

Table 5: Bi-iliocristal width of Budapest boys and girls in different growth studies*

Age group (years)	Means of boys (cm) 1969	1984	1995	Means of girls (cm) 1969	1984	1995
3	16.22	16.8	16.89	16.03	16.3	16.29
4	16.93	17.1	17.10	17.06	16.7	17.00
5	17.67	17.7	18.10	17.75	17.6	17.88
6	18.68	18.8	18.86	18.53	18.6	18.69
7	19.65	19.2	19.41	19.27	19.2	19.25
8	19.91	20.0	20.34	20.00	20.0	20.52
9	20.73	20.9	21.17	20.80	20.9	21.33
10	21.47	21.8	22.30	21.64	21.8	22.27
11	22.52	22.5	23.30	22.59	23.2	23.53
12	23.12	23.2	23.94	23.66	24.4	24.49
13	24.10	24.5	24.75	24.72	25.6	25.83
14	25.50	25.7	26.32	25.53	26.3	26.67
15	26.31	26.6	26.78	26.84	27.2	26.99
16	27.62	27.2	27.44	26.81	27.5	27.19
17	28.16	27.6	27.85	27.19	27.5	27.36
18	28.56	27.7	27.62	26.68	27.6	27.23

* see Table 1

Table 6: Chest circumference of Budapest boys and girls in different growth studies*

Age group (years)	Means of boys (cm) 1969	1984	1995	Means of girls (cm) 1969	1984	1995
3	52.25	53.0	52.06	51.54	51.7	50.18
4	54.18	54.1	52.61	53.31	52.8	51.47
5	55.63	54.7	54.63	55.31	54.3	53.71
6	57.87	58.0	56.68	56.92	56.7	55.71
7	59.23	58.9	59.12	57.80	58.1	57.67
8	61.16	61.3	61.76	59.99	60.2	61.47
9	63.64	63.6	64.98	62.43	62.5	64.33
10	65.83	67.1	68.56	65.54	65.5	67.37
11	69.50	69.7	71.76	68.87	69.6	71.37
12	70.74	72.7	75.02	72.08	73.7	74.31
13	73.98	76.7	76.61	76.55	77.5	78.45
14	78.02	81.1	80.92	79.74	78.8	80.88
15	81.19	84.4	83.87	81.27	81.1	82.34
16	86.01	87.2	87.36	81.83	82.0	82.29
17	88.25	89.8	89.16	81.47	82.5	82.08
18	88.85	90.7	90.71	80.23	81.8	82.85

* see Table 1

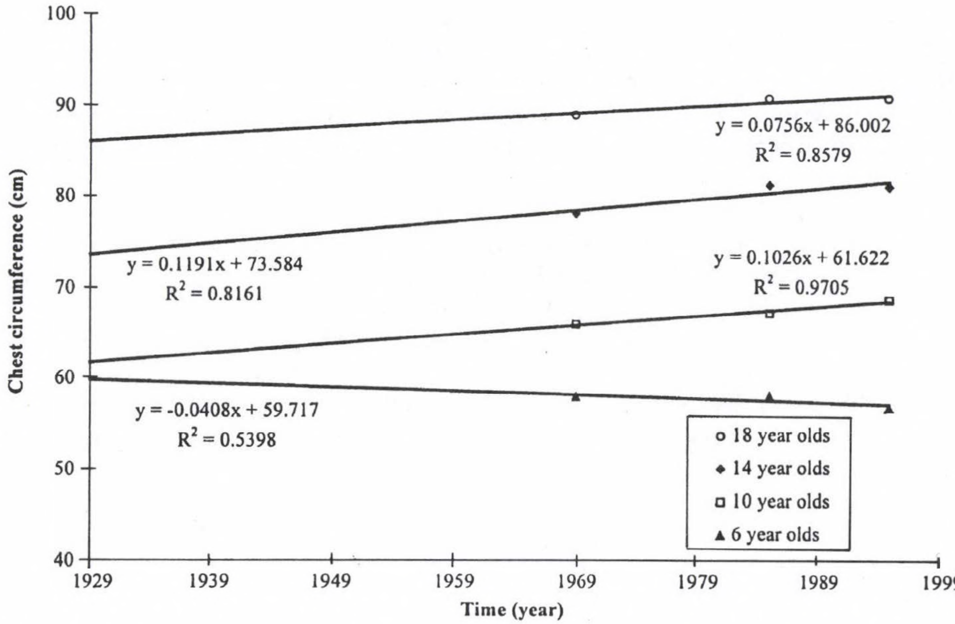

Fig. 11:. Linear regression equations and trend lines for chest circumference of Budapest boys.

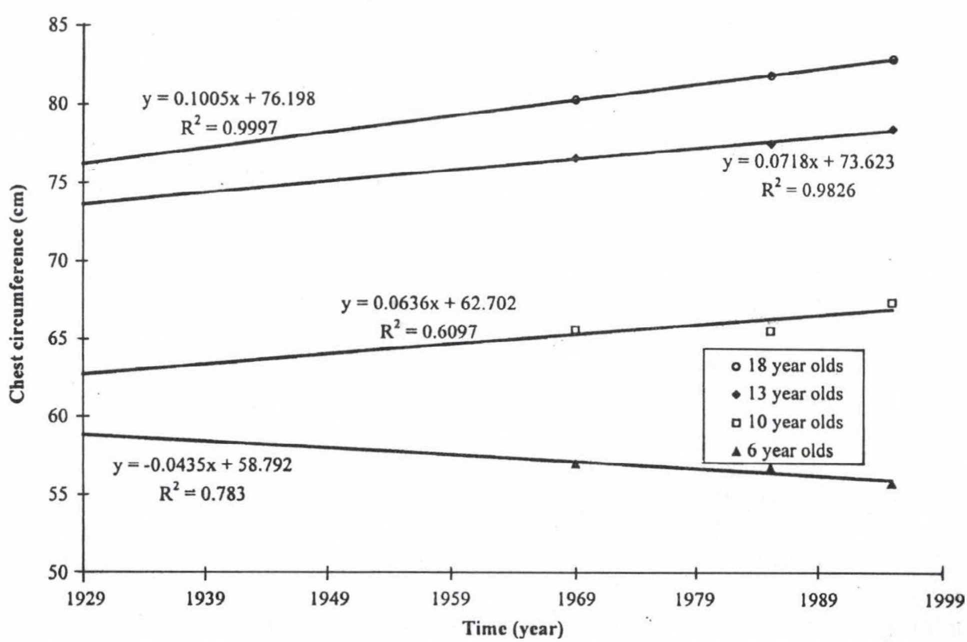

Fig. 12: Linear regression equations and trend lines for chest circumference of Budapest girls.

Discussion

Trend analysis showed generally positive secular changes (with some fluctuations) in the growth of these six body measurements, but the velocity of changes was different according to body measurements, age groups and sex. Nevertheless there are some age groups in the case of bi-iliocristal width and chest circumference where significantly negative trend can be seen (coefficient a is negative).

Increase in height and weight is constant in early childhood in the boys then it becomes quicker gradually from the age of prepuberty. The rate of increase is the highest at age of 14 years. Girls differ from the boys a little bit: here gradual increase can be seen from early childhood to the age group of 13 year olds. I think it is not accidental that the age of highest rate in the increase coincides more or less with the age of pubertal growth spurt found in the 1994/95 sample.

It is well known that positive secular trend in growth is present in levels of two phenomena: on one hand development accelerates (certain growth stages manifest earlier and earlier) and on the other hand the means of final height and weight (and many other body measurements) are higher than years before. This explains that the highest rate can be found around the current age of pubertal growth spurt: at that time double effect to be felt, namely shifting of pubertal growth spurt to younger age and growth to be taller and heavier etc. in adulthood than the previous youth was.

The yearly rates of increase are high (0.35 cm in the height and 0.29 kg in the weight in the boys as well as 0.27 cm and 0.23 kg in the girls, respectively at this age. Then the increase is lesser and lesser in the older age groups as the pubertal growth spurt attenuates.

Changes of other body measurements show more or less positive secular trend too, but the changes of velocities of increase are not so clear like in the case of height and weight: rates of increase (coefficients of steepness) fluctuate (except biacromial width where tendencies are very similar to those of height and weight).

Similarly to the trends of height and weight however, the highest steepness values are mainly in the regression equations of adolescents being at the recent age of pubertal growth spurt (i. e. 12-15 year olds). This interval is broad but we should not forget that girls reach puberty earlier than boys and the velocity peaks in growth are at different times in the different body measurements.

It is important to mention that bi-iliocristal width of 18 year old boys became significantly smaller during the period investigated and in young groups of both boys and girls chest circumference show negative tendency too (see figures). These indicate some changes in the body proportions and especially in the final body proportions of boys.

When secular growth changes are analysed many points of view should be considered. There is an old an important but I think a little bit forgotten one. This is the theory of "biomorphosis" (Bürger 1957). It says that secular trend are not confined to children and adolescents. Quicker growth and growing to be taller are only the most striking phenomena of positive secular trend. It involves changes of morphology and physiology of human and it is in direct relation with the changes of morbidity and mortality. Positive changes of morbidity and mortality and the prolongation of expected lifetime not only run parallelly with positive changes in growth but they have the same reasons.

If we take into consideration the facts mentioned above and examine indices of morbidity and mortality of Budapest population in this century it can be seen that spectacular improvement of these (particularly improvement of infant mortality) support the positivity of secular trend. It is true looking at the 20th century as a whole. Statistics show however, that about from the middle of eighties these indices are getting worse again or are not improving. Rates of infectious diseases (such as tuberculosis) increase as well which is connected with increasing poverty (Kemény et al. 1995).

Investigating only this last decade from the point of view of growth data practically there were not changes in body measurements examined during this period (Németh and Eiben 1997). These data together refer to the change of direction of secular trend or at least to slowing down in increasing trend.

It was observed in some Western European countries that positive secular trend slowed or halted in children's growth and maturation (Lindgren 1991). It is caused by the particularly high living standards by which biological maximum in growth could be reached more or less. I think that this reason can be precluded in Hungary knowing the facts mentioned above.

Last but not least it is important to mention two methodological problems. On one hand: when secular growth changes are analysed considering such a long period we must reckon with that measuring methods and selection of subjects can be changed. These can influence findings relevantly. On the other hand statistical analysis has significant effect too. Linear regression is only one of the methods by which we can estimate secular changes. This method showed no significant changes during the period investigated in some age groups in the case of certain body measurements (where trend lines do not differ significantly from the horizontal one). In other cases R^2 is rather low which indicates that connection between the measurement and the time is not linear that is these measurements at some ages do not grow linearly (in these cases linear regression is not appropriate for analysis, results are false). In few age groups low R^2 and horizontality occur together. Summarising it must be emphasised: this estimation on secular growth changes in Hungary between 1929 and 1995 clarifies the problem only from one side, therefore we must not preclude other results of other methods of assessment.

Acknowledgements: This study was granted by the Hungarian National Foundation for Scientific Research (OTKA T 013098) and the Behavioural Doctoral Programme of the Eötvös Loránd University. The author also thank to Dr. Éva Bodzsár and Prof. Ottó Eiben for their useful and constructive advises as well as to Mr. Olivér Váczi for his help in processing data and preparing tables and figures.

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AGE CHANGES OF BODY MEASUREMENTS OF YOUNG ADULTS IN HUNGARY

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Abstract: *Age changes of body height and body weight were analysed in a sample of Hungarian university students (3,918 twenty years old male and 659 nineteen years old female students), who were investigated between 1976-1985. Every students were measured twice, first time in the first and second time in the fifth (last) academic year of their study at the university. The results showed positive age changes of these body measurements, which were different according to the place of birth of the students, as well as the effect of the positive secular trend.*

Key words: *Body height; Body weight; Age changes; University students; Place of births.*

Introduction

Body measurements change not only in childhood during the growth process, but in adulthood, too. These age changes can be investigated both by longitudinally and cross-sectionally. However, in cross-sectional studies the results show not only the "pure" age changes of the body measurements, but the effects of the secular trend and the selective survival to them, too (Susanne 1980). The majority of the studies concerning these changes reported only the stature, and only some of them contain data about the other measurements of the body and head (Susanne 1980).

The number of the studies referring to the age changes of the young adults under age of 30 are also very limited (Büchi 1950, Gsell 1966, Miall et al. 1967, Borkan and Norris 1977). Therefore the aim of this study is to analyse the changes of body height and body weight in young adults in Hungary.

Material and Methods

The data were obtained during medical checks carried out on Hungarian university students at the Health Center of the Technical University of Budapest. The sample consists of ten consecutive classes of the students of this university, who were registered between 1976-1985. They were investigated twice, first in the second term of the first academic year, and second, in the first term of the fifth (last) academic year during their studies at the university.

Here only the data of the two largest age groups, i.e. the male students (n=3,918), who were 20 years old in the time of the first investigation, and the female students (n=659), who were 19 years old in the time of the first investigation, were taken into consideration. Among the several body measurements which were investigated, only body height and body weight are utilised in this study.

Results and Discussion

The body height and body weight of the male students (Table 1) show an almost continuous increase in the investigated ten consecutive classes both in the first and the fifth academic year, in spite of the small yearly fluctuations, which are regular of such studies. This may be caused by the secular trend and it agree well with the results of an other study of us, which also showed positive secular trend in Hungarian university students (Gyenis and Till 1986).

In connection with the age changes in the sample the data of the male students in every classes are higher in the fifth, than in the first year. The differences in body height are between 0.34 cm and 0.86 cm, while the differences in body weight are between 1.96 kg and 3.21 kg, and all of them are significant (Table 1). In comparison with our data Büchi (1950) observed 0.75 cm increase in stature in males between 20-37 year of age.

The data of the female students (Table 2) show the same tendency as the data of the male students. Thus, the values of the two body measurements increased during the investigated period (with small yearly fluctuations), but in body weight the differences between the values of the first and the fifth years are much more smaller in female, than in male students. The differences in body height are between 0.21 cm and 0.72 cm, and all of them are significant, while the differences in body weight are between 0.03 kg and 0.93 kg and only three of them are significant. In Büchi's (1950) sample the increase in body height of the females was 0.54 cm between 20-28 year of age.

The data were analysed according to the birth place of the students, too. The male students (Table 3) born in Budapest are taller and heavier, than the students born elsewhere in the country, both in the first and the fifth academic year. The change in body height with the age are the same in the two groups (0.58 cm), but the change in body weight is larger in the group of the students born elsewhere in the country (2.67 kg), than in the students born in Budapest (1.82 kg), and all of the differences are significant.

In female students it can also be seen positive age changes in both body measurements according to the place of birth, but the differences between the values of the two groups are smaller, than in male students (Table 4). In contrary to the data of the males, the changes are larger in female students born in Budapest, than in students born elsewhere in the country. The differences in body height and body weight are significant for those students, who were born in Budapest, while in students born elsewhere in the country only the body height showed significant difference.

Summarising our results, the data of body height and body weight of our sample show well the positive age changes of the measurements investigated longitudinally in a 3.5 year interval between the first and fifth academic years, as well as the effect of the secular trend. Finally, we also found differences in age changes of these body measurements between the male and the female students according to their place of birth.

Acknowledgement: This study was supported by the Hungarian National Foundation for Scientific Research (OTKA grant No. I/3/2225).

Table 1: Height and weight of the male students in the 1st and 5th academic year of their study

		Height						Weight					
Year of the first		**1st academic year**		**5th**		**Diff.**		**1st academic year**		**5th**		**Diff.**	
investigation	**n**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
1976	489	175.37	6.38	176.23	6.41	0.86***	0.79	67.19	8.19	69.26	9.16	2.07***	4.24
1977	450	175.63	6.25	176.47	6.26	0.84***	0.78	67.72	7.86	69.66	8.74	1.94***	4.08
1978	355	177.14	6.61	177.86	6.72	0.72***	0.85	68.37	8.65	70.89	9.75	2.51***	4.20
1979	374	177.38	6.63	177.83	6.66	0.45***	0.88	68.30	8.71	70.68	9.01	2.38***	3.53
1980	373	177.36	6.30	177.76	6.31	0.40***	0.77	68.35	7.49	71.55	8.78	3.21***	4.02
1981	439	177.71	6.70	178.14	6.74	0.43***	0.76	68.85	8.69	71.53	9.64	2.67***	4.36
1982	418	177.84	6.51	178.40	6.55	0.56***	0.74	69.37	8.36	71.33	9.56	1.96***	4.36
1983	431	177.57	6.31	178.06	6.31	0.49***	0.72	69.58	8.87	72.11	10.09	2.52***	4.21
1984	327	177.29	5.99	177.83	6.06	0.54***	0.68	69.53	7.91	71.64	9.29	2.11***	4.47
1985	262	177.48	6.37	177.81	6.40	0.34***	0.70	70.40	7.93	72.42	8.98	2.02***	4.26
Total	**3,918**	**177.00**	**6.47**	**177.58**	**6.48**	**0.58*** **	**0.79**	**68.65**	**8.34**	**70.99**	**9.37**	**2.34*** **	**4.19**

***$p<0.0001$

Table 2: Height and weight of the female students in the 1st and 5th academic year of their study

Year of the first investigation	n	Height: 1st academic year Mean	Height: 1st academic year SD	Height: 5th academic year Mean	Height: 5th academic year SD	Height: Diff. Mean	Height: Diff. SD	Weight: 1st academic year Mean	Weight: 1st academic year SD	Weight: 5th academic year Mean	Weight: 5th academic year SD	Weight: Diff. Mean	Weight: Diff. SD
1976	74	163.38	5.97	164.01	5.85	0.64***	0.69	54.82	6.74	54.97	6.67	0.16	3.22
1977	72	163.03	6.72	163.70	6.61	0.67***	0.63	56.24	7.92	57.02	7.09	0.78	3.82
1978	71	165.00	5.92	165.72	6.05	0.72***	0.80	56.44	7.00	56.91	7.05	0.47	3.77
1979	64	165.57	5.08	165.81	6.00	0.24*	0.74	55.86	5.14	56.50	5.51	0.64	3.54
1980	71	165.09	5.75	165.54	5.70	0.45***	0.64	56.57	7.30	57.50	7.17	0.93*	2.92
1981	58	165.20	5.60	165.76	5.60	0.56***	0.76	56.43	6.33	56.46	6.07	0.03	2.97
1982	51	164.95	6.38	165.51	6.35	0.57***	0.72	55.62	6.23	55.98	5.94	0.36	2.65
1983	79	165.63	6.02	165.84	6.13	0.21*	0.61	55.69	6.27	56.41	6.18	0.72*	3.15
1984	62	165.33	5.66	165.68	5.64	0.35***	0.51	57.05	6.97	57.57	7.07	0.52	4.50
1985	57	164.22	6.16	164.56	6.14	0.34**	0.68	56.91	6.68	57.42	6.47	0.51	3.97
Total	**659**	**164.72**	**5.97**	**165.19**	**5.95**	**0.47****	**0.70**	**56.14**	**6.71**	**56.66**	**6.57**	**0.53***	**3.48**

*p<0.05
**p<0.001
***p<0.0001

Table 3: Height and weight of the male students in the 1st and 5th academic year of their study according to their birth place

		Height						Weight					
		1st academic year		5th		Diff.		1st academic year		5th		Diff.	
Birth place	**n**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
In Budapest	1,525	177.54	6.58	178.12	6.61	0.58***	0.78	69.32	8.72	71.15	9.47	1.82***	4.05
Elsewhere	2,393	176.66	6.37	177.24	6.38	0.58***	0.80	68.23	8.05	70.90	9.28	2.67***	4.23
Total	**3,918**	**177.00**	**6.47**	**177.58**	**6.49**	**0.58*** **	**0.80**	**68.65**	**8.33**	**70.99**	**9.35**	**2.34*** **	**4.20**

*** $p<0.0001$

Table 4: Height and weight of the female students in the 1st and 5th academic year of their study according to their birth place

		Height						Weight					
		1st academic year		5th		Diff.		1st academic year		5th		Diff.	
Birth place	**n**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
In Budapest	303	165.40	5.99	165.92	5.99	0.51***	0.68	55.85	6.98	56.83	6.73	0.99***	3.11
Elsewhere	356	164.14	5.90	164.58	5.85	0.44***	0.71	56.38	6.46	56.52	6.45	0.13	3.71
Total	**659**	**164.72**	**5.71**	**165.19**	**5.95**	**.47*** **	**0.70**	**56.14**	**6.71**	**56.66**	**6.58**	**0.52*** **	**3.47**

***$p<0.0001$

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Anthrop. Közl. *38;* 55-60. (1996/97)

DETERMINANTS OF HEIGHT, WEIGHT AND BMI OF 3 TO 7 YEAR OLD CHILDREN FROM BRATISLAVA

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Abstract: *The effect of various factors on height, weight and BMI of 3 to 7 year old children was studied in a cross-sectional sample of 1024 girls and 1065 boys from Bratislava, Slovakia. Multiple regression was used to study the effect of age, sex, birth weight, birth length, duration of breast feeding, stature of parents, body weight of parents, birth order, number of siblings, persons per room, education of parents, per capita income, ownership of a car, smoking habits of parents and level of air pollution (SO_2, H_2S, lead, dust and soot) at the place of residence. Altogether these variables account for 76.5%, 55.1% and 13.4% of the variance of height, weight and BMI, respectively. While the effect of sex on all three growth parameters is negligible in early childhood, age is the most important determinant of height and weight of children of the respective age groups. BMI shows a slightly decreasing trend with increasing age, reflecting a linearisation of body built from age 3 to 7 years. When age and sex are controlled height and weight of parents are the most important determinants. While height and weight are positively related with both size parameters of the parents, BMI increases with weight of the parents, but decreases with increasing stature of parents. Furthermore birth length has a statistically significant ($p < 0.05$) positive effect on height and weight is positively associated with birth weight. BMI increases with birth weight and decreases with birth length. The only other factor which shows an effect on height and weight when all other variables are controlled is the smoking habit of the parents. Height of children of smoking parents tends to be lower than that of children from non-smoking parents, while on the other hand weight tends to be higher. These effects are also reflected by the results for BMI, which is significantly ($p < 0.05$) higher for children of smoking parents. In this study air pollution does not have an effect on height and weight. BMI, however, is positively related to increased levels of lead pollution, i.e. children residing in areas with comparatively high concentrations of airborne lead have a higher BMI than children from areas in which the acceptable level is not exceeded. On the other hand BMI is negatively related to the level of soot pollution. Although the effect is comparatively small with regard to the explained variance, both pollutants show to some extent a dose dependent effect.*

Key words: *Height; BMI; Socio-demographic factors; Air pollution.*

Introduction

Growth, which is a basic characteristic from conception through at least the first two decades of postnatal life, is the results of complex interactions between the genetically determined growth potential coded by the DNA and many - social, cultural, emotional, material, biochemical - environmental factors. The growth of a single child reflects the outcome of a very specific interaction between a quite unique individual genetic make-up and a just as unique environmental setting, and we are not able to disentangle the contribution or the effect of a single factor at the level of the individual. At the population level, however, we might approach the problem of quantifying the magnitude of the effect of different factors with the use of multivariate statistical methods. Since the effect especially of different environmental factors may vary from population to population it was the aim of the present study to identify some of the variables which are associated with variations of growth in height, weight and BMI of pre-school age children in Bratislava.

Material and Methods

Sample: The results are based on cross-sectional growth data of a sample of n = 2,098 3 to 7 year old boys and girls. The data have been sampled from 1988 to 1991 in 52 Kindergartens spread over the whole city area of Bratislava.

Data: The independent variables used in statistical analyses are: birth weight, birth length, height and weight of parents, duration of breast feeding, birth order, number of siblings, number of persons per room, ownership of a car and/or an allotment, education of parents, per capita income, smoking habits of parents and concentration of SO_2, lead, dust, soot and H_2O.

The metric traits (dependent variables) considered here are height, weight and body mass index (BMI). The response rate for somatometric traits was close to 100% (original sample size was n = 3,059), while the response rate for questionnaires was approximately 70%. There were no differences in the distribution of metric traits between children of responding and non responding parents.

Statistical Methods: The multivariate statistical methods used in the present analysis require that the dependent variable follows a Gaussian distribution. Since this requirement only applies for height several power transformations were used to get normally distributed BMI and weight data (Danker-Hopfe, Cermáková and Drobná 1996). For weight the best approximation could be obtained with α = -1 and for BMI α = -0.5 yielded the best result.

Results and Discussion

Growth is a process which is obviously reflected by changes in size parameters with age and often there are sex specific variations in those parameters as well. This is shown by the results of analysis of variance with age and gender being the only independent variables. Height increases significantly with age while there are no sex differences for children of the respective age groups. Weight also increases with age and is slightly higher in boys as compared to girls, at least for 3 and 4 year old children and BMI finally decreases very slightly with age and shows almost no sex differences in spite of the statistically significant effect which results from the large sample. The magnitude of the effect of these two variables is reflected in the amount of variance explained by these two independent variables. For height it is almost 62.6%, for weight it is 41.8% and only 1.3% of the variation of BMI in the data can be explained by age and gender.

In a next step of analysis multiple linear regression models focusing on main effects were used to study the effect of the independent variables mentioned above. Variables measured on a metric scale were entered as continuous variables, those measured on a nominal or ordinal scale have been dichotomised. Thus altogether 40 independent variables have been entered into regression analyses.

When all independent variables - including age and sex - are used in regression analysis, the amount of explained variance varies from 76.5% for height over 55.1% for weight to 13.4% for BMI. This reflects that 13.9,13.3 and 12.1% of the variance of height, weight and BMI, respectively, is explained by independent variables other than age and gender.

To eliminate most of the effect of age and the effect of gender, in further analyses age and sex standardised values (SD- or z-scores) were used as dependent variables instead of original measurements and transformed values, respectively.

Table 1: Results of regression analysis based on SD-scores with 38 independent variables (p-values: ns: not significant, *: 0.05 > p > 0.01, **: 0.01 > p > 0.001; ***: p < 0.001).

Variable	Height	p	Weight	p	BMI	p
Constant	-17.147	***	-8.601	***	4.883	***
Elevated lead level	0.050	ns	0.386	ns	0.528	*
High lead level	-0.126	ns	0.483	ns	0.896	*
Slightly. elev. soot level	0.131	ns	-0.275	ns	-0.565	**
More elev. soot level	-0.020	ns	-0.305	ns	-0.459	*
High soot level	0.310	ns	-0.258	ns	-0.734	**
Birth weight (kg)	0.076	ns	0.257	***	0.338*10-3	***
Birth length (cm)	0.061	***	0.017	ns	-0.048	**
Father's height (cm)	0.035	***	0.013	**	-0.015	***
Father's weight (kg)	0.006	*	0.014	***	0.016	***
Mother's height (cm)	0.038	***	0.012	**	-0.021	***
Mother's weight (kg)	0.008	**	0.019	***	0.021	***
Ownership of an allotment	0.116	*	0.052	ns	-0.037	ns
Months of breast feeding: 2-4	0.130	**	0.014	ns	-0.118	*
Months of breast feeding: > 4	0.106	ns	0.066	ns	-0.011	ns
Smoking father: < 11 cig./d.	-0.112	*	-0.023	ns	0.077	ns
Smoking father: > 10 cig./d.	0.005	ns	0.111	ns	0.173	*
Smoking mother: < 11 cig./d.	0.059	ns	0.132	*	0.122	*
Smoking mother: > 10 cig./d.	-0.066	ns	0.084	ns	0.146	ns

Note: Since for none of the growth parameters the regression coeffcients of the dummy variables coding for elevated sulphur dioxide levels, elevated dust levels, elevated H_2S levels, birth order, number of siblings, number of persons per room, ownership of a car, education of parents and per capita income was statistically signifcant, they are not listed in this table.

The results of multiple regressions analysis for height (Table 1) show that none of the regression coefficients of the dummy variables coding for elevated levels of air pollution, birth order, number of siblings, number of persons per room, ownership of a car, education of parents and per capita income differed significantly from zero. Height is positively associated with birth length - not with birth weight -, father's and mother's height as well as father's and mother's weight. Furthermore children who were breast fed for at least one month tended to be slightly taller than formula-fed children. Ownership of an allotment was also positively related to height, while children of smoking fathers tended to be shorter than children of non-smoking fathers. Both p-values , however, were close to insignificance and the effect of smoking was not consistent, so that statistical significance here does not necessarily reflect that the observation is biologically meaningful.

Using the amount of variance explained by different sets of independent variables as a proxy of the magnitude of the biological significance of the effect it shows (see Table 2) that of the altogether 25.1% of variance of height SD-scores which is explained by the set of all independent variables 21.5% are explained by birth size parameters and height and weight of parents. Other factors, including SES, only account for 3.1% of the variance. Height and weight of the parents alone account for 19.3% of the variance and height of the parents alone can explain 17.5% of the variance of z-scores of height of the children. The data furthermore indicate that height and weight of parents don't have completely independent effects, and they also show that size at birth effects and the effect of size of parents are not completely independent.

Table 2: Amount of variance (%) of SD-scores explained by different sets of independent variables.

Set of Variables	Height	Weight	BMI
38 independent variables	25.1	18.2	12.5
Birth length and weight,height and weight of parents	21.5	15.9	9.2
38 independent variables minus birth lenght and weight; height and weight of the parents	3.1	2.4	3.7
Birth length and weight	6.7	7.1	3.0
Height and weight of parents	19.3	13.2	7.3
Height of parents	17.5	7.0	0.1
Weight of parents	7.8	11.2	5.6
BMI of parents			7.2

For weight only 5 of the altogether 38 independent variables are statistically significant different from zero. Height and weight of both parents and birth weight - not birth length - are positive predictors of the weight of the children. Furthermore one of the positive coefficients of the variables coding for parent's smoking habits was statistically significant. Children of mothers smoking less than 11 cigarettes/day tend to have a little more weight than children of non-smoking mothers, but again the observation concerning the effect of smoking is not completely consistent.

A comparison of the amount of variance of z-scores for weight explained by different sets of independent variables shows that of the 18.2% of the variance of the SD-scores of weight 15.9% can be explained by height and weight of parents and birth size. All other factors account for only 2.4% of the variance - with the underlying model not even being statistically significant. While birth weight and height account for 7.1% of the variance height and weight of the parents alone might explain 13.2%. Again the results show that these two sets of variables share some common explained variance. While for height of the children height of the parents has the greatest effect, for weight it is the weight of parents, which alone explains 11.2% of the variance of the weight of the children.

For BMI a slightly different picture emerges. Again height and weight of parents have a statistically significant effect. While birth length was a predictor of height in childhood and birth weight was a predictor of weight, both are predictors of BMI. All weight variables are positively related to BMI, while all length variables show negative associations with BMI in childhood.

The results of regression analysis furthermore show that breast-fed children tend to have a lower BMI in childhood than bottle-fed children or those who have been breast-fed only for a short period of time. Differences in weight in early childhood according to the mode of nutrition are well documented. In countries where formulae of high quality are available and the risk of contamination is low, breast fed infants on average are lighter during the first months and years of life, respectively, than their bottle-fed counterparts. The effect of breast-feeding on weight in childhood could not be shown in the present study, but it seems that BMI is even more affected by early infant feeding practices than weight.

Furthermore two of the regression coefficients coding for smoking habits of the parents are statistically significant. For BMI the results are consistent and they point towards a dose-response-relationship. Children of smokers have a higher BMI than children of non-smokers. The effect of smoking can be considered as an effect of indoor air pollution. A growth inhibiting effect of smoking during pregnancy is well documented so are several health effects of ETS exposure in early postnatal life. Studies related to effects of ETS on postnatal growth, however, are comparatively scarce. There are papers , e.g. by Rona, Chinn and Florey (1985) and Berkey, Ware, Speizer and Ferris (1984), showing that the height of ETS exposed 5 to 11 year old children is smaller than that of non-exposed children, even if birth weight, height of parents, number of siblings and an index of room quality is statistically controlled.

Finally two air pollutants show a statistically significant effect on BMI. That elevated soot levels are associated with a lower BMI corresponds to what we might expect. From experimental studies it is known that exposure to PAH (polycyclic aromatic hydrocarbons) which are set free by incomplete burning of organic substances and which are known to be adsorbed to soot particles leads to a decrease of body weight in animals.

The results concerning the effect of lead might be more surprising. Although in the present study no effect of lead pollution on height and weight was observed, BMI is higher in children exposed to elevated lead levels. This observation corresponds to some data from the literature. Recently Danker-Hopfe and Hulanicka (1995,1996) found a statistically significant earlier occurrence of menarche in a sample of girls from lead smelter neighbourhoods in Upper Silesia. This association persisted when education of the father, economic situation of the family and family size were controlled. On the other hand several studies have shown, that weight and body composition, respectively, are correlates of the timing of occurrence of menarche. Furthermore a study by Kim, Hu, Rotnitzky, Bellinger and Needleman (1995), which is based on the data from the Boston Longitudinal Study on effects of low level lead exposure showed that dentine lead level was not only a statistically significant predictor of BMI in children even when age, sex, baseline body size and mother's socio-economic status were controlled, but was also a predictor of changes of BMI in a longitudinal perspective. Kim et al. (1995) summarise their observation as follows: „The results suggest that chronic lead exposure in childhood may results in obesity that persists into adulthood".

Thus the observed positive relation between BMI and lead exposure is not a completely isolated observation. The effect is even much more marked for skinfold thicknesses and an anthropometrically derived index of %fat, this, however will be discussed in more detail elsewhere.

Although this aspect certainly deserves further recognition we have to be aware that for BMI as well as for height and weight the effect of individual growth dispositions as reflected by birth size and height and weight of parents is more important than the effect of other independent variables, like air pollution and smoking habits of parents. Of the 12.5% of the variance of BMI z-scores explained by all independent variables only 3.7% are explained by factors other than height and weight of parents and size parameters at birth. While the latter set of variables accounts for 9.2% of the variance height and weight of parents alone may account for 7.3% of the variance of BMI z-scores, the same amount can be explained by the BMI of parents.

Conclusion

Individual growth dispositions and prenatal development for which birth weight and length as well as height and weight of the parents, respectively, are indicators, are the most important determinants of height, weight and BMI of 3 to 7 year old children in Bratislava, with height of the parents being the most important factor for height and weight being the most important factor for weight and BMI being the most important factor for BMI

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Anthrop. Közl. *38;* 61-68. (1996/97)

SECULAR GROWTH CHANGES OF LJUBLJANA SCHOOLCHILDREN IN THE PERIOD FROM 1958 TO 1994 (LONGITUDINAL SERIES)

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Abstract: *Paper deals with the results of comparisons of three longitudinal research project of growth in adolescence period of schoolchildren in Ljubljana (1958-1962, 1978-1982 and 1990-1994). We could compare only boys and girls at the age of 10 and 14 years and parameters: height, weight and sitting height. In the last two surveys we could analysed also BMI and Manouvrier Index. Secular growth changes in height shows greater increases in boys than in girls. The increses are greatest at 14 years old boys. Weight shows similar tendency but with lower intensity. BMI in both sexes and both ages after 12 year period decrease. In the years 1990-1994 the number of children with over normal weight decrease. Manouvrier Index shows that number of boys and girls with longer legs increase from 1978-1982 to 1990-1994 period.*

Key words: *Secular trend; Ljubljana children*

Introduction

In the last century all over the world the phenomenon of the secular trend was established and investigated. Secular trend can be decribed as follows: a series of long-term, systematic changes in a wide variety of anthropological characteristics in successive generations of a population living in a certain geographic region (Eiben 1989, Wolanski 1978). Historical data on physical growth are always full of problems of sampling (van Wieringen 1979). One way to overcoming this is to concentrate on a single regional area. Most of analyses are carried out on cross sectional semples and on stature and. weight. (Tanner 1990, van Wieringen 1978, Wolanski 1978).

In Republic Slovenia and its capital Ljubljana secular trend was analysed by Brodar (1981, 1991), Tomazo-Ravnik (1981, 1986, 1988, 1991), Dovečar (1975, 1978, 1993), Šturm, Strel (1984), and Štefančič (1994, 1996).

This paper describes the changes in height, weight, BMI and Manouvrier Index of Ljubljana schoolchildren measured longitudinaly in the periods 1958/62, 1978/82 and 1990/94. The three periods in which the children were measured were characterized by specific political and also socio-economical conditions. The aim of our study is to analyse the results and look to differences that occur during 20 and 12 years difference. Is secular trend still observable in what intensity and direction?

Material and Methods

We compare the results of three longitudinal growth survey done in Ljubljana. First research of such type was done in Slovenia by the pediatric doctor Meta Skeget, head of

Child Policlinic in Ljubljana. The measurements were done between the years 1954 and 1972 on children in Ljubljana from 7 till 18 years of age. They measured 30 parameters made three photographies and also the radiology of hand. The only results that were able to be used were the so called preliminary report with the data on stature, weight, and breadths. Unfortunately, because of dr. Skerget's death, original data disappeared. The second and third longitudinal surveys were done by the Anthropological section at the Department of Biology, University of Ljubljana. Second research project started 1978 with the 7 years old children and lasted only 5 years till the age of 11. We then repeated the measurements of stature, weight and sitting height on the same group at the end of our primary schooling at the age of 14. The third survey in 1990 started with 10 years old children but again unfortunately ended with measurements at 14 years. So we compared the results of measurements of stature and weight at the age of 10 and 14 of all three surveys. For the last two surveys we had also individual data so we calculated body mass index (BMI) as: weight (kg)/height^2 (m^2) and index of Manouvrier (Indice Skelique) as the ratio between the trunk and the lower limbs. For BMI we made also a frequence distribution of three BMI categories according to norms of Frisancho (1990). The first group with values over P 75 consists of children with over normal weight according to their height, in second group children with values for BMI between P 25 to P 75 - normal weight and in third group are values of BMI under P 25 - under normal weight. Because of relatively small number of children in the last survey we made only those three categories. The so-called Indice Skelique proposed by Manouvrier is used with formula: (standing height - sitting height)*100/sitting height. On the basis of this formula the following classification for both sexes was established:

brachyskelia:	up to 84.9
mesatyskelia:	85.0 to 89.9
macroskelia:	90.0 and over.

The macroskelic type may be defined as having relatively long legs and short trunk, while the brachyskelic has, on contrary short legs and a long trunk.

The differences between mean values was tested with Student t-test.

Results

In girls statistically significant is only the difference between the mean value of height in group 78/82 and group 90/94 at the age of 10. The differences between other groups are smaller and not statistically significant.

In boys statistically significant are the differences between mean values of the second and third survey and at 14 also between the first and second. We can see great difference in 14 years old group where during a 12 years period the increment in height arised up to 5.6 cm. Sexual difference is increasing. In the last survey at the age of 10 is 1.9 cm and at the age of 14 is 8.5 cm. In the research 78/82 - 0.8 cm and 3.0 cm and in the oldest research those differences are 0.4 cm and 1.9 cm (Table 1).

Body weight in girls shows a decreased value in last survey 90/94. Girls are in average at 10 years lighter for 0.6 kg and at 14 years even for 2.1 kg. The differences are not statistically significant. Body weight in boys during the 32 years period has slowly increased. The differences are not statistically significant neither at 10 nor at 14 years old groups. Girls are in both age groups in the first and second survey heavier than boys, in the last survey girls are lighter at 10 years for 1 kg and at 14 years for 4 kg (Table 2).

Table 1: Average height (cm) of Ljubljana schoolchildren from 1958 to 1994 (longitudinal series)

Series	N	Boys Mean	SD	N	Girls Mean	SD
1958/62						
10 years	50	141.4	5.3	55	141.0	6.5
14 years	38	164.2	6.2	46	162.3	6.6
1978/82						
10 years	112	141.0	5.4	121	141.8	6.2
14 years	112	166.7	7.6	121	163.7	5.5
1990/94						
10 years	39	144.9	5.5	34	143.0	6.3
14 years	39	172.3	7.4	34	163.8	5.9

Table 2: Average weight (kg) of Ljubljana schoolchildren from 1958 to 1994 (longitudinal series)

Series	N	Boys Mean	SD	N	Girls Mean	SD
1958/62						
10 years	49	34.2	5.8	55	34.3	15.4
14 years	37	52.9	8.1	46	55.3	10.5
1978/82						
10 years	112	35.0	6.5	121	36.3	7.8
14 years	112	56.4	10.2	121	57.1	9.2
1990/94						
10 years	39	36.7	7.6	34	35.7	6.5
14 years	39	59.0	10.2	34	55.0	8.1

In girls the mean values for BMI are higher than in boys. In the groups of 10 years old and in the groups of 14 years old girls the values for BMI diminish from 18.0 to 17.4 at 10 years and from 21.3 to 20.5 at 14. The differences are not statistically significant. In boys the mean values at the age of 10 are the same but at the age of 14 we can again see a lower value after a 12 years period. Mean value for BMI in the year 1982 was - 20.2 and in the year 1994 - 19.8 (Table 3).

Table 3: Average values for BMI

Series	N	Boys Mean	SD	N	Girls Mean	SD
1978/82						
10 years	112	17.5	2.4	121	18.0	3.2
14 years	112	20.2	2.7	121	21.3	3.2
1990/94						
10 years	39	17.5	2.8	34	17.4	2.8
14 years	39	19.8	2.7	34	20.5	3.3

Frequence distribution of three BMI categories show that in both surveys children with normal weight prevail. The values are higher in girls group in 90/94 research and in boys in 78/82 research. In the second position there are groups of children with under normal weight and in the third position children with over normal weight. The only exception are girls in 78/82 where the situation is opposite (more overnormal cases).

During a 12 years period we can see some changes in the distribution. In girls middle group prevails in the years 90/94 at 14 years even up to 79.4 %. In the distribution of other two groups of BMI we could notice that in 78/82 the group with over normal weight is bigger than the group of under normal weight at both age groups. The situation after 12 years is quite opposite. We have more girls with under normal weight values than over normal weight. This fact is even more evident at the age of 14.

In boys in 78/82 and in 90/94 the groups with over normal weight values are a little bit smaller than those with under normal weight values. After a 12 years period in boys group the number of „slimer“ and „fatter“ cases increases so the values for normal weight categories are lower.

At the age of 14 we have in 90/94 25.6% of „slimer“ boys and 14.7% of girls and 12.8% „fatter“ boys and only 5.9 % of girls (Table 4).

Table 4: Frequence distribution of BMI

Categories	Boys 1978/82		Boys 1990/94		Girls 1978/82		Girls 1990/94	
	10y	14y	10y	14y	10y	14y	10y	14y
over n. weight	18.8	14.2	23.1	12.8	20.7	18.2	11.8	5.9
normal weight	59.8	70.5	48.7	61.5	64.5	70.2	73.5	79.4
under n. weight	21.4	15.2	28.2	25.6	14.9	11.6	14.7	14.7

Because of the longitudinal way of measurement we also analysed the changes of categories during growth: from 10 to 14 in each individual. In the groups of girls in the last survey no one of girls became „fatter“. Most girls remain of normal weight or change their BMI values from over normal to normal or under normal to normal. In the last survey there are also 17.7 % of girls which became „slimer“.

Also in boys groups the category of normal weight is the most stable. Bigger difference among the generations is in group that remains of under normal weight and changes of over normal to normal. In last survey also among boys no one became „fatter“ (Table 5).

For the last two surveys we have also the data for sitting height so we calculate the so called Manouvrier's Index of Body Build. We analysed the changes between generations and between sexes in brachyskelic type - short legs and long trunk, mesatyskelic and macroskelic type as having relatively long legs and short trunk.

Generational changes of mean values in girls show slight increase at 10 years old group and slight decrease in 14 years old group. The situation in boys is opposite: at 10 years slight decrease and in 14 years slight increase. All changes are not statistically significant (Table 6).

Table 5: Changes of categories of BMI (from 10 to 14 years)

Changes of categories	1978/82	1990/94	1978/82	1990/94
	Girls		Boys	
remain of normal weight	57.9	61.8	55.3	46.1
remain of overnormal weight	11.6	5.9	13.4	12.8
remain of undernormal weight	7.5	2.9	10.7	23.1
overnormal to normal weight	7.5	5.9	5.4	10.3
normal to overnormal weight	4.1	0	0.9	0
normal to undernormal weight	4.1	11.8	3.6	2.6
undernormal to normal weight	6.6	11.8	10.7	5.1
undernormal to overnormal weight	0.8	0	0	0

Table 6: Average values for Manouvrier's index

Series	N	Boys Mean	SD	N	Girls Mean	SD
1978/82						
10 years	112	91.4	4.1	121	91.3	4.3
14 years	112	95.5	5.4	121	91.4	4.7
1990/94						
10 years	39	91.2	4.5	34	91.6	4.7
14 years	39	96.3	5.0	34	90.9	5.2

The frequence distribution of Manouvrier's Index in girls groups shows the highest values for macroskelic type. We notice that the percent values for brachyskelia between the age of 10 and 14 increase, but is low. Masatyskelic type with ages decreases more in the survey 1990/94. Boys with long legs prevail in all groups except at 10 years in 90/94.

The incidence of short legs is very low at 10 years and zero at 14. As we expected, the number of mesatyskelic type decreases. This process is very intensive in 90/94 when number of boys with mesatyskelia fall from 52.8% to 5.6% (Table 7).

Table 7: Frequence distribution of Manouvrier's index

Categories	Boys				Girls			
	1978/82		1990/94		1978/82		1990/94	
	10y	14y	10y	14y	10y	14y	10y	14y
brachyskelia	3.6	0.0	5.6	0.0	7.4	9.1	3.0	11.8
mesatyskelia	33.9	13.4	52.8	5.6	33.9	32.4	47.1	29.4
macroskelia	62.5	86.6	41.7	94.4	58.7	59.5	50.0	58.8

Discussion and Conclusions

Secular changes have not been uniform between the two samples and depend largely on variation in living condition. Changes are largest during puberty and relatively smaller in adults. Its vary with social classes. Although the positive trend is still evident in some countries, they have diminished or stopped in many developed countries (Lindgren 1976, Malina 1990, Susanne 1985)

Changes in Ljubljana schoolchildren 7 to 11 years old shows in height and weight during the period from 1939 to 1979 (Tomazo-Ravnik 1981) statistically significant differences in both sexes at 11 years between the periods 1939 and 1954/66. The increase in stature was 6.8 cm in boys and 6.6 cm in girls and in weight 5.8 kg in boys and 6.0 kg in girls. After the year 1966 the differences are smaller and not significant.

Dovečar (1993) has followed trends in growth in schoolchildren and youth (11 to 18 years old) in Slovenia-Ljubljana during 1939/40, 1969/70 and 1981/82 periods. In 42 year period the positive growth changes in both sexes and in all age groups in final size of body height, weight and biacromial measures are proved. This trend is also obsevable in the majority of age groups for chest circumference. In bitrochanterical breadth there prevail in girls negative growth tendencies, which are significant in girls from 14 years onwards and in boys at 18 years of age. In 12 years period accelerated growth in height is not followed by adequate gaining of weight and also negative tendencies are indicated. In bitrochanterical breadth negative tendencies still prevail, significantly from 14 years of age on.

Brodar (1991) and Ravnik (1991) analysed secular trend in student population in Slovenia. This group express increases in stature and weight but decreases in some breadth dimensions.

On the basis of Körmend Growth Study data Eiben (1987, 1995) conclude that children of younger series are taller and heavier, but somewhat more linear and fatter than decades ago.

Prokopec (1994) compare the series measured from 1951 to 1991 on children aged 0-19 years. The trend to taller stature was greatest in the first decade from 1951 to 1961 and was more or less diminishing in each succesive decade. The surwey brought clear evidence that physique in postadolescent girls changed and that there was a lack of secular trend in growth in babies. BMI shows a marked change in body proportionality in girls from 15 years onward. The negative influence of World War II was also observed. Both sexes show rebounds of BMI curves around the age of 5 years.

Prebeg (1995) analysed the secular trend over the years 1951 to 1991 in Zagreb schoolchildren aged 7-19 years. The most pronounced changes appeared from 1951 to 1964. Later on the increases became smaller and in the last period 1982-1991 the trend seemed to came to an end. Changes in average weight mostly coresponded to the height changes, beeing somewhat greater in boys. In the last two periods, weight gain in older girls was smaller compared to height.

Cernelud and Lindgren (1991) studied heights, weights and BMI of Stockholm schoolchildren at the ages 7, 10 and 13, born in 1933, 1943, 1953 and 1963. The intensity of increases in height and weight diminished. The BMI indicated a continuous trend towards a slimmer body build for children at the age of 7 years. At the age of 10 and 13 years the BMI ramained fairly stable for the cohorts from 1943 to 1963.

On the basis of our analyses we can conclude that generational changes are still going on. Positive and negative social and economic changes touched also the growth dinamic of a studied age groups of children.

Positive secular trend we could observe in stature, is more intensive in boys and in weight as well. In the last years in girls weight diminishes at 10 and 14 years.

The same trend we could observe in both indices. Mean values for BMI diminish - number of children with undernormal weight became higher. Children with longer legs prevail, intensively in boys. In 14 years old girls the number of cases with short legs increases in both surveys. According to our results we can also conclude that the generations became more gracile. This trend is also obseved by many other human biologists.

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Anthrop. Közl. *38;* 69-73. (1996/97)

NEW APPROACH TO THE EVALUATION OF SECULAR TRENDS IN THE CZECH CHILDREN AND ADOLESCENTS

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Abstract: *Body height, body weight data and BMI index of 274081 boys and 268974 girls of Czech Republic at the age 0-18 years were collected in five Nation-wide Anthropological Surveys of Children and Adolescents (1951-1991). These data were processed by a new way approach to anable evaluating secular trends (multiple linear regression, combination of polynominal regresion and Fourier's analysis). The resulting data expressed in graphs enable detailed analysis of development of these parameters of last 40 years. The study also shows that the all growth trends known from longitudinal studies are reflected in the graphs of secular trends.*
Key words: *Secular trend; BMI; National Growth Study.*

Introduction

The conditions for the growth and development of the Czech child population were during the last decades comparable with the position in advanced countries. Evidence of this fact are the results of monitoring of the height, body weight and other physical characteristics of a representative sample of the child population. Nation-wide anthropological surveys (CAV) are conducted regularly in the Czech Republic since 1951, always after ten-year intervals and provide ample material for the evaluation of trends and other analyses.

Material and methods

History of anthropological research in the Czech Republic: Hundred years ago in 1985 J. Matiegka and L. Niederle undertook a growth study of Czech children which comprised around 100 thousand school children from 6 to 14 years. The aim of this survey was made possible by voluntary help of school teachers from all parts of the country.

The first post-war survey of the Czech child population, the biggest in the history and fully representative, took place in 1951. There were two reasons for undertaking this survey - the creation of growth standards for the Czech child population and assessment how the children's growth was affected by the Second World War. In each of the first four surveys a representative sample (3-5%) was examined which corresponds to 80 - 120 000 subjects aged 0 - 18 years. The 1991 survey was implemented under new conditions of structural changes in the health services.

The Czech population is ethnically homogeneous with a relatively small proportion of ethnic minorities. In the examined sample (in 1991) other than Czech nationalities were recorded in 1.2% of cases, one third of this total (0.4%) being children of Slovak nationality. The remaining 0,8% of the examined sample are formed by children of Hungarian, Ukrainian, Polish, German and Gypsy nationality. The sample of 86 846 children includes the urban and rural population in ratio of 1 : 1.

Data collection: In each age category under 1 year of age 300 - 400 children of each sex were measured. Age categories 1 to 6 years and 6 to 18 years comprised 1000 - 2000 children for each sex respectively. Anthropometric data of children younger than 6 years were obtained in clinics by instructed health professionals, mainly paediatricians, who organised also the distribution of questionnaires to parents, to obtain the necessary complementary information about the children. Teachers in primary and secondary schools were provided with written instructions, measuring aids and requested to obtain data from children in their care. A group of already employed adolescents was surveyed by instructed health professionals from regional and district Public Health Institutes (Lhotská et al. 1993, 1995).

The five nation-wide anthropological surveys of children and youth implemented between 1951 and 1991 were organised in such a way that age groups 1 to 34 comprised some thousand people who were measured. In addition to the opportunity of accurate evaluation of correlations with age (e.g. percentiles) , it is possible to assess from these extensive data secular trends. In our surveys we assessed secular trends of height, body weight and BMI for the whole range of age groups from one month to 17.5 years concurrently.

Statistics: To reveal causal and suppress incidental factors the regression method is used. In simpler cases we try to interpolate a curve between the points which depend on one variable. In our case, when the parameters depend on two variables (age and year of survey), we try to find optimal equations of curved surfaces.

In all instances we used multiple linear regression where as the system of functions in the direction of age (x axis a combination of polynomial regression and Fourier's transformation was used and in the time line of individual surveys (y axis) polynomial regressions grade three. Moreover in the calculation functions were included which represent products of the two systems of functions, but only the more important ones because with regard to stability it was not possible to calculate matrices larger than 60x60.

We use Fourier's transformation because, contrary to other methods used (polynomial, logarithmic, exponential and others), the system of functions we use for approximation is orthogonal. Different approximating functions do not correlate with each other and the solution is accurate and does not break down even when the material is extensive. Fourier's analysis gives a correct picture because it does not anticipate any a priori knowledge of the data.

In calculations in the direction from a more complex to a simpler functional system gradually (by the F test) insignificant functions were eliminated. In all instances some 20 important coefficients remained.

For graphic presentation the linear measure of age proved unsuitable because the very interesting trends during infant age would be concealed. After attempts to use a logarithmic scale of the x axis, it proved finally most illustrating to preserve a constant interval of various age groups: the range of 34 age groups is essentially logarithmic(up to one year by months, up to 2.5 years by quarters of a year, up to four years by half a year and subsequently after one year). That means every transverse line indicates a category.

The use of actual values (cm, kg) to express parameters does not illustrate the secular trends sufficiently clearly. Therefore each figure was calculated also in per cent in relation to values recorded in the survey of 1951.

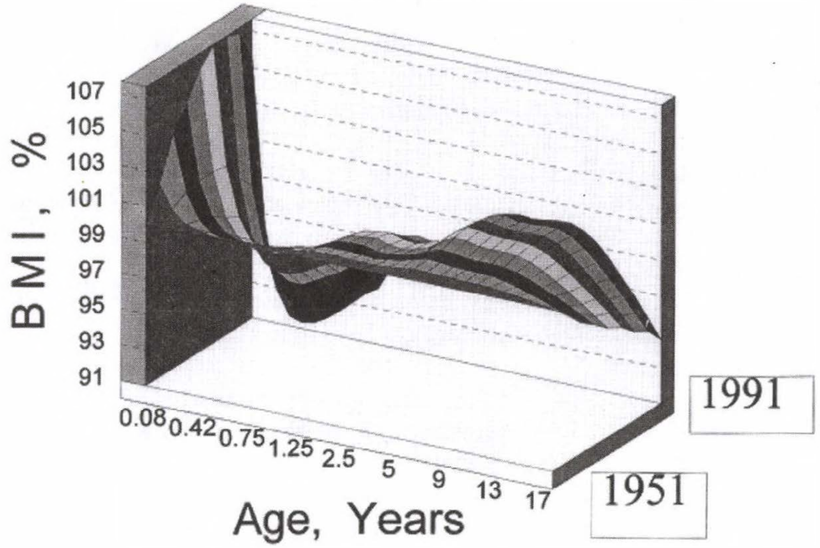

Fig. 1: Trend of BMI in %, Girls, N=268974

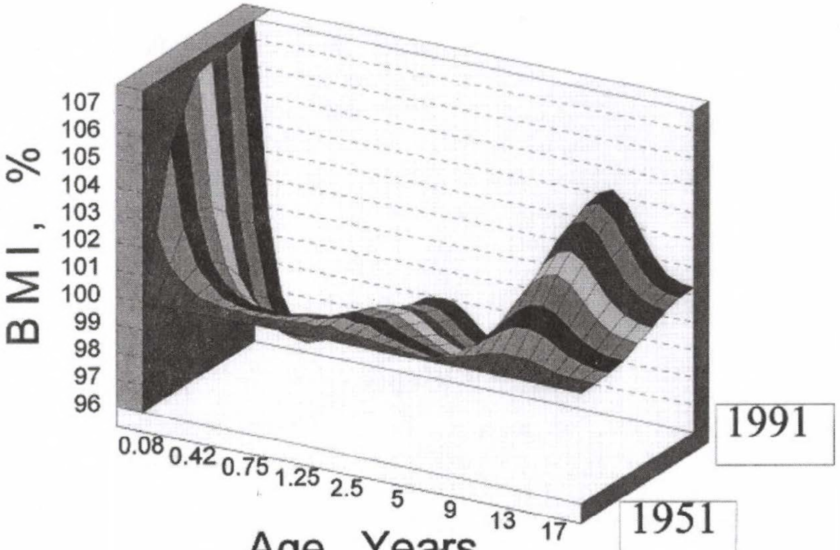

Fig. 2: Trend of BMI in %, Boys, N=274081

Results

Our analysis presents secular trends not only during the period of adolescence, as customary, but throughout the period of childhood and adolescence, from birth to the age of 17 years. As basis for the required calculations and construction of figures served published data of height and body weight of all five Nation-wide Anthropological Surveys between 1951 and 1991 (a total of 274 081 boys and 268 974 girls). The data on body weight, body height and BMI has been published elsewhere (Bláha et al. 1994, Bláha et al. in prep).

The chronological 40-year period was divided in the figures into eight zones, i.e. one zone corresponds to a five-year interval.

The *Body Mass Index* seems to us the most illustrative example for the short review of our analysis of secular trends. Naturally, we have studied the secular trend separately in boys and girls.

Boys: In absolute values has a typical shape and even at the age of 17 years we can notice a marked rising trend. In the percentage presentation (Figure 1) we can observe in boys that the rising trend at the age of 17 years is slowed down. The greatest increase of BMI is observed at the age of 11 years, i.e. at the onset of the prepubertal period. During the period of the mid-growth spurt we can notice a slight decline of BMI values and a slight increase near the age of 1.5 years. A priority finding is the drop of BMI in infant age. We think it is due to a decline of bottle-feeding of infants as confirmed among others by the fact that up to 1961 the BMI of infants was rising and then began to decline, the decline being more marked during the last 15 years. This obviously is associated with the dietary change (for more details see Lhotská et al. 1995).

Girls: The course of absolute values has also a typical shape. In the highest age groups we do not observe a rising, but a declining trend which is described during the last twenty years as a slimming trend. The declining trend in infant age is, contrary to boys, more marked. The figure 2 presenting relative values confirms the fact that the BMI of 17- and 18-year-old girls has a declining secular trend. On the other hand, near the age of 9 years the BMI rises markedly and it increases also near the mid-growth spurt. As compared with boys, the rise is more marked, while it is less pronounced round the age of 1.5 years. The drop of BMI in infant age is much more marked than in boys - cca 9% as compared with 3% during the last survey. We are unable to explain this intersexual difference.

Conclusion

The graphic presentation of percentage values indicates in addition to the pubertal growth spurt also a further acceleration or deceleration of growth which formerly could be recorded only when evaluating data from longitudinal surveys. This, no doubt, deserves a more detailed analysis which is beyond the framework of the present study.

Summary

The extensive and unique data on height and body weight from five surveys conducted during the last 40 years (274 081 boys and 268 974 girls from birth to the age of 18 enabled us, due to a new approach to the processing of data, to elaborate objective basic data for the analysis of the secular trend in the Czech population. The data are presented in graphi-

cal form. From a brief analysis of basic results, and in particular the percentage presentation of the trend, we may foresee: a further increase of the mean height, though not evenly with age. A similar trend is apparent in the boys body weight except for the younger age groups where at the age of cca one year during the last 15 years a decline of body weight was recorded. In girls this trend is more marked. Conversely in adolescent girls there is a marked slimming trend during the past 20 years. The causes of these trends which are more clearly demonstrated by the BMI index will require more detailed analysis. Some, though not all, were indicated in our paper.

*

Acknowledgement: This analysis has been supported by IGA MZ of Czech Republic - grant No. 1870-3, 3979-3.

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Anthrop. Közl. *38;* 75–80. (1996/97)

CHANGES IN BODY FAT DURING PUBERTY IN ATHLETIC BOYS

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Introduction

In studying athletic children adipose tissue has a particular importance. Intense physical training is an important factor in the regulation of body mass and some of its components. Surprisingly, knowledge about the trends in body fat content of athletic children is largely lacking. It would be important to know if individual fat patterns are stable or one should expect remarkable changes during childhood and puberty. Different events prefer or allow different amounts of body fat and adiposity also may be a limiting factor in athletic performance.

Another motivation to study body fat was the strange allusion in a few reports to the existence of a "preadolescent fat spurt" (Brook 1978) or "pre-adolescent fat wave" (Falkner 1975, Malina and Bouchard 1991) concerning which Brook admitted "... we do not understand [it] at all..."

The aim of this paper was to study the changes in body fat content during puberty. Our paper focused on both the relative and absolute mass of fat.

The approaches used were:

To follow the development of the fat stores with age.

To determine the peak of fat percentage wave and analyze the changes in fat mass using this criterion.

To study the relationship between the timing of the peak of fat percentage and other events of puberty.

Materials and methods

The sample consisted of 60 athletic boys of the longitudinal growth study of our sport club. They were measured in intervals of half a year. The criteria for including them in the present study were an age of between 10 and 15 years and having eight consecutive measurements at least. Many of them attended much more occasions of measurement so the whole age range that could be investigated became somewhat broader. At the extremes of the age range case numbers were above 25.

The 60 boys were engaged in 10 sports events. The majority of them were gymnasts (N=18) and judoists (N=12). No effort was made to have a sample representative of the events.

Fat mass was determined by the Drinkwater-Ross (1980) four-component body mass fractionation model. Fat percentage was obtained by dividing this fat mass estimate by individual body mass.

Relative and absolute body fat estimates were analyzed along age first.

Then the age of the peak fat percentage was determined set to zero age for the individual, to which levels of the preceding and following half-year measurements of fat percentage were compared. Aligned for these individual peaks, both fat percentage and fat mass estimates were averaged around the peak. The mean age at peak relative fat content was obtained by averaging the individual zero ages. To find peak velocities of height and mass (PHV, PMV) the increment method was used.

Dates of the first ejection were also collected and so mean age at spermarche as an indicator of sexual development could be calculated.

In addition to basic descriptive statistics (mean and SD) linear correlations were computed between the age at spermarche, the age at peak fat content and ages at the respective peak velocities.

Results and discussion

Figure 1 shows fat mass and percentage along age.

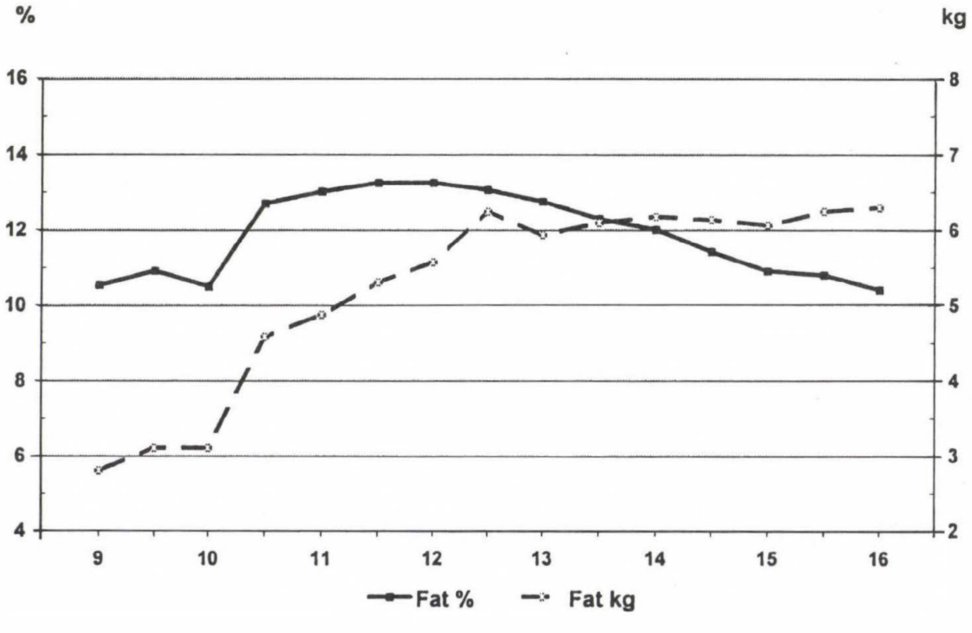

Fig. 1: Body fat by age
Dots and solid line: Fat%
Asterisks and dashed line: Fat mass

The overall increase in fat mass was 3 kg, in the age range between 10 and 12.5. Before 10 years of age and after age 13 there was very little change though body mass grew steadily.

Mean fat percentage varied between 10 and 14% a relatively low level compared to peer-age non-athletic boys, a fact due to sports selection, in our opinion. Inter-individual variability was high throughout the whole age range. Gymnasts were the leanest (between 8 to 12%) and waterpolo players were the fattest (20 to 28%). Except the time of the peak intraindividual values varied little with age, however.

There was a sharp increase of 2.2% between 10 and 10.5 years, then until age 12 all the increase was merely 0.5%. After that age a more or less steady decrease followed. The sharpness of the increases in both absolute and relative fat mass between ages 10 and 10.5 might in part be attributed to an increase in the number of events in the sample at this age. Nevertheless, the further course of both curves suggests that even without this interference there would have been a steeper increase than either before or later.

The increase and decrease in fat content observed in our material has already been described in non-athletic subjects by other authors, few of whom, however, could provide reasons for it. Tanner and Whitehouse (1975) examining the ontogenetic changes in triceps and scapular skindfold thickness found a fat wave to occur in boys age between 10 and 14 years. Falkner (1975) reported that the "pre-adolescent fat wave", though less marked, was present also in girls, but has criticized the term because he thinks the phenomenon belongs to adolescence.

Knittle (1978) studied the size and number of adipose cells in normal and obese children longitudinally. He found little changes in this respect in nonobese children between 2 and 10 years of age but after this age both fat cell size and number increased. Brook (1978) in a longitudinal study corroborated Knittle's results and opined that the accumulation in body fat was due to an increase in cell number rather than to one in cell size. Referring to Tanner and associates' 1966 study he remarked "... the fluctuations in skinfold thicknesses suggest cyclical accumulations of fat and lean tissue during childhood with fat accumulation predominating in early childhood and at puberty" (Brook 1978).

Malina and Bouchard (1991) studying the ratio of the sum of skinfold thicknesses on the trunk and the extremities also referred to the fat wave and tentatively attributed it to a feature of subcutaneous fat on the trunk since they found the relative amount of fat on the trunk larger than on the extremities in this period.

The phenomenon was also observed in two of our previous mixed longitudinal studies (Pápai et al. 1991, 1992). Both the one in athletic boys and the other in non-athletic boys displayed this increase and decrease of fat content, the rise being slightly larger, the decrease slightly smaller in non-athletes. As for its timing, the onset of the increase was earlier (age 8) and lasted longer (4 years) in non-athletes who also were consistently fatter than the athletes, a difference of about 4%. It is noted that the method of fat estimation was the same in all of these studies.

Figure 2 shows the peak-aligned curves of fat% and the amount of fat mass belonging to the respective fat percentage. As noted, on the abscissa was that age at which the child's fat percentage was the highest, starting from which point all half-yearly means were plotted symmetrically. The mean age at the peak of fat% was 12.15±0.98 year.

As shown rapid fat apposition began one and a half years before the peak. In this representation the rise was about 3.5%, starting from 11.2% of fat. After the peak first a sharp decrease of 1.5% was observed followed by a less one. Two and half years after the peak the share of fat percentage in body mass was the same as before the increase.

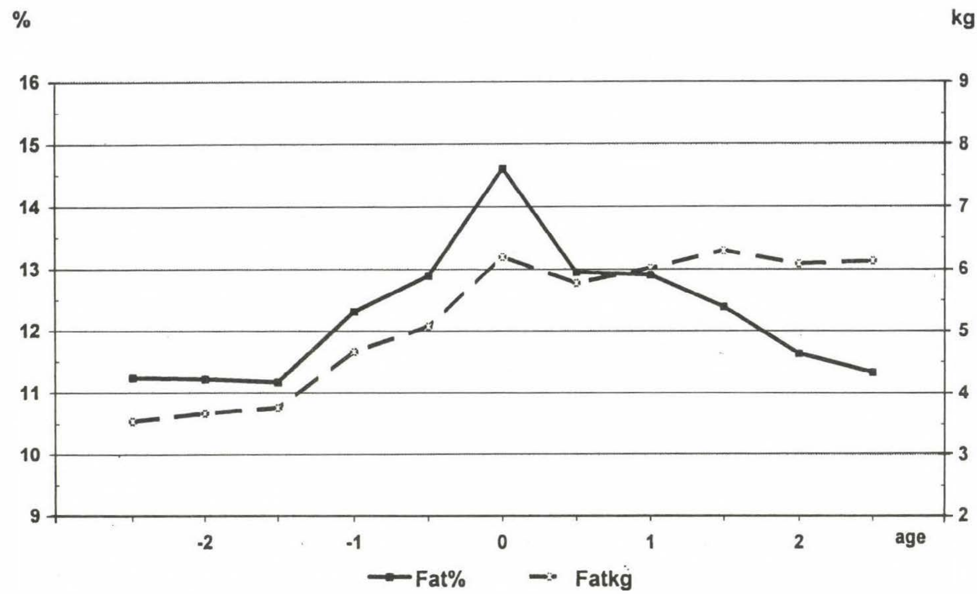

Fig. 2: Body fat by the peak of fat percentage
Legend as in Fig. 1.
Zero point of abscissa: Mean age at the highest fat%.

The rise in fat percentage and its peak were found to precede the first signs of sexual maturation in only one-third of the sample. In one of our cross-sectional studies athletic boys were grouped by the developmental stages of genitalia (Pápai, unpublished data). Here too fat percentage was higher in genital stages G1-G2 of the boys than in the later ones. These data suggest that this observed fat accumulation occurs before or around the onset of sexual maturation. The curve of the absolute fat mass in this representation displays a concurrent rise of 2.5 kg. After the peak of fat percentage fat mass did not change practically in the observed period.

We also studied the timing of maturation and somatic events in relation to the observed fat peak. The mean ages for spermarche, PHV and PMV are shown in Table 1. The fat peak preceded all these events. One of our regional cross-sectional studies referring to non-athletic children showed that the boys after the age of their first ejection had less fat in the same chronological age than their counterparts (Pápai 1992). The ages at which these developmental phenomena occurred lay already in the decreasing phase of fat percentage and coincided with a stability in fat mass.

Table1: . Mean ages of some pubertal events

Mean age	Mean	SD
Fat% peak	12.15	0.98
Spermarche	13.57	0.76
PHV	14.04	0.93
PMV	14.20	1.02

Spermarche can be regarded as a midpubertal event. Reviewing the few Hungarian studies on this topic, it was found to occur between genital stages 3 and 4 (Eiben et al. 1992) or in G4 (Pápai et al. 1994, Pápai and Szabó 1996), before or close to peak height velocity (PHV). In this sample spermarche occurred about 1.5 years later than the peak of fat percentage and a half year before PHV. The timing of PMV was the latest and it showed the greatest variability.

Table 2: Correlations between the timing of pubertal signs and fat peak

Mean ages	1	2	3	4
1 Fat% peak	-	0.52	0.58	0.50
2 Spermarche		-	0.72	0.63
3 PHV			-	0.85
4 PMV				-

r ($P<5\%$)= 0.27

Note: Case number is 53 because in 7 subjects neither PHV nor PMV could be reliably assessed.

The connections between the ages of these variables are presented in Table 2. The correlation between spermarche and the peak velocity of fat percentage was not too close, although it shows that there may be some link in also males between sexual maturation and the changes in fat content. The relationship between the timing of the fat peak and PHV was somewhat closer than with spermarche. The connection with the age at PMV was moderate too. These results also show that the peak in body fat percentage is an early event of adolescence and is only moderately related to other somatic signs of puberty and maturation.

Summary conclusions

Development of body fat percentage in this athletic sample agreed in its time course with previous reports of Hungarian and other authors, but was consistently less.

The phenomenon of "pre-adolescent fat wave" (Falkner 1975, Brook 1978, Malina and Bouchard 1991) or spurt was demonstrable also in these athletic boys. Chronologically, relative body fat peaked between 12 and 12.5 years of age but this peak was quite flat distributed over several years. This peak amounted to an increase of about 2.7% parallel with a change of 3.2 kg in fat mass.

When the data were aligned according to the peak of fat percentage, similar values were obtained (3,5%, resp. 2.5 kg), but the time course was more pregnant.

This "fat wave" preceded the time of spermarche, an indicator of functional gonadal development. Fat% peak also preceded the mean ages at PHV and PMV.

The correlations with the time of peak height and mass velocities, respectively spermarche were moderate, but not negligible.

During the period of advancing sexual maturation and intense somatic growth the decreasing share of fat in body mass was associated with an almost unchanged fat mass. Body fat in young athletic males appears to have small contribution to the steep increase of body mass in puberty. This observation as well as the low level of body fat may be related to the more intense physical activity.

Studying the "pre-adolescent fat wave" we tried to reveal some of its characteristic features and its connection to other events of puberty. We have to admit that we could not add too much to the nature and reasons of it. One cannot but speculate about its importance. It could be an expression of the changing metabolism and maturation of adipose tissue. It may be one of the early signs of the onset of male puberty.

So far as the term "pre-adolescent fat wave" is concerned our opinion is near to Falkner's (1975). Its appearance seems to signal the approach of pubertal changes and closes pre-adolescence rather than specifies it. Thus the term "proto-adolescent fat wave" seems to be preferable.

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Anthrop. Közl. *38;* 81-85. (1996/97)

ANTHROPOMETRIC AND EXERCISE PHYSIOLOGICAL CHARACTERISTICS OF 12-YEAR-OLD SOCCER PLAYERS

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Abstract: *The purpose of the present study was to compare selected anthropometric and exercise physiological characteristics of 12-year-old male soccer players grouped by their weight-related aerobic power.*

Height, body mass, relative muscle and fat masses, growth type indices, aerobic power, oxygen pulse and pH were compared in 51 boys grouped by weight-related aerobic power (G I: VO_2 below 50 ml×kg^{-1}×min^{-1}; G II: between 50-60 ml×kg^{-1}×min^{-1} and G III: above 60 ml×kg^{-1}×min^{-1}).

The mean difference between G I and G III in peak-exercise oxygen consumption was approximately 20 ml×kg^{-1}×min^{-1}. Theoretically, a half of this difference could be explained by the differences in relative muscle mass and oxygen pulse of the compared groups. Though accepting the importance of regular physical activity, the authors also stress the impact of inherited or endogenous limits on the trainability of aerobic power.

Key-words: *Growth type indices; Relative fat and muscle masses; Aerobic power; Young soccer players.*

Introduction

Aerobic power is one of the physiological determinants of good and excellent sport performance. It is a general experience in exercise physiological investigations that non-athletic and regularly training youngsters of similar age can differ markedly in their weight-related aerobic power (Bar-Or 1983, Demeter 1981, Froberg et al. 1991, Kemper 1995, Mészáros et al. 1991, Mészáros 1995). Rowland (1989) found a close relationship between VO_2max and cardio-respiratory endurance in adults. In young subjects, especially in novice athletes, this connection can be weakened by a number of age-dependent factors.

The purpose of the present study was to compare selected anthropometric and exercise physiological characteristics in 12-year-old male soccer players grouped by their weight-related aerobic power measured during a laboratory exercise test.

Subjects and Methods

The 51 subjects (aged chronologically between 11.51-12.50) were all members of the same Budapest sport club. They were selected and qualified as talented by their their coach relying on their motor test performance scores one year before the present anthropometric and spiroergometric investigation. During this one year period they had five training sessions a week, led by the same coach.

Body build was described using Conrad's method (1963). Body fat content and weight-related muscle mass were estimated by regression equations (Drinkwater and Ross 1980). Biological development was assessed by their morphological age (Mészáros et al. 1984). In taking the necessary body dimensions the suggestions of the International Biological Program (Weiner and Lourie 1969) were followed.

For the all-out treadmill exercise a Jaeger μ-DATASPIR analysor and treadmill were used. Following individual warming-up, exercise began at 12 kmh belt speed. Starting from zero degree, increments of 3 degrees in belt incline were used every second minute until exhaustion. Blood pH was determined by the Astrup technique (using arterialized capillary blood samples of 10 μl) at the time of the highest respiratory exchange ratio observed during the recovery period.

The total sample (N = 51) was divided into the following subgroups:

- Group I: aerobic power below 50 ml $\times kg^{-1} \times min^{-1}$ (n = 14).
- Group II: aerobic power between 50-60 ml $\times kg^{-1} \times min^{-1}$ (n = 20).
- Group III: aerobic power greater than 60 ml$\times kg^{-1} \times min^{-1}$ (n = 17).

Inter-group differences between the means were tested by the F-test at the 5% level of random error, following a one-way ANOVA. Relationships between relative aerobic power, respectively weight-related muscle mass (%), oxygen pulse (O_2P [ml$\times$beat^{-1}]) and pH were analyzed by linear correlation coefficients.

Results and Discussion

Since this sample of young soccer players was selected by their coach on the basis of previous motor test performance, it was a surprise to find that very few (altogether 17) of them had an aerobic power exceeding 60 ml$\times kg^{-1} \times min^{-1}$. It is noted that aerobic power was not a criterion in the selection of the trainer.

Table 1: Subgroup means and standard deviations of the studied anthropometric and exercise physiological variables.

	GROUP I		GROUP II		GROUP III		
Variable	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**P**
CA	11.93	0.28	11.91	0.29	11.97	0.25	N.S.
MA	12.09	0.71	11.47	0.66	11.62	0.83	N.S.
BH	151.73	7.71	147.10	7.11	151.78	9.51	N.S.
BM	40.54	7.45	36.42	7.50	38.29	7.16	N.S.
MIX	-1.40	0.25	-1.38	0.24	-1.46	0.31	N.S.
PLX	71.01	3.15	69.43	4.66	70.59	4.06	N.S.
F%	13.07	3.11	12.30	3.41	9.97	1.92	P<0.05
RVO_2	46.67	2.50	55.06	2.83	66.18	2.68	P<0.05
O_2P	9.74	1.65	10.42	3.02	12.89	2.21	P<0.05
pH	7.17	0.05	7.20	0.06	7.21	0.04	P<0.05

Abbreviations: CA = calendar age (yr.), MA = morphological age (yr.), BH = height (cm), BM = body mass (kg), MIX = metric index (cm), PLX = plastic index (cm), F% = weight-related fat content (%), M% = weight-related muscle mass (%), RVO_2 = aerobic power (ml$\times kg^{-1} \times min^{-1}$), O_2P = oxygen pulse (ml$\times$beat^{-1}), N.S. = no significant difference between the means.

This low frequency of higher aerobic power was surprising because of their young age. Bar-Or (1983) has found that relative aerobic power is usually greater in prepubescence than in adolescence and adulthood. The number of subjects having an aerobic power below 50 ml×kg^{-1}×min^{-1} was also remarkable among these previously selected young soccer players (Table 1).

The players of Group III had significantly smaller body fat content and greater relative muscle mass than the members of Group I. The significantly greater mean weight-related aerobic power was associated with a higher oxygen pulse and peak-exercise bood pH.

As evidenced by the linear correlation analysis, there were significant relationships between weight-related oxygen consumption, respectively relative muscle mass, oxygen pulse and blood pH (Figures 1-3). Relative aerobic power was consistently and positively correlated with muscle mass, oxygen pulse and higher (less acidic) pH.

Common variance of the statistical relationships ranged between 27 and 45%. The mean difference in oxygen consumption between G I and G III was approximately 20 ml×kg^{-1}×min-1. Theoretically, 50% of this observed difference could be explained by the differences of the compared groups in relative muscle mass and oxygen pulse. We have no further explanation for the remaining 50%.

The problem is, however, more complicated than that so we must not simplify it to a computation procedure. Since relative aerobic power and oxygen pulse were proportionate to relative muscle mass, we had to assume that the players of Group III. could extract more oxygen peripherally than those of Groups I. and II. Sargent and Davies (1977) pointed out the importance of both peripheral oxygen extraction and muscle mass for VO_2max. This line of thought takes us, however, near to the cell level, in other words, to the endogenous components of aerobic power.

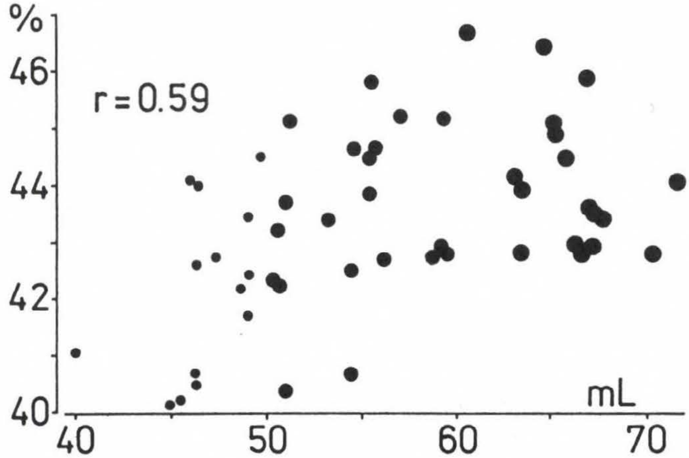

Fig. 1: Relationship between relative muscle mass (ordinate) and weight-related aerobic power (horizontal axis). $r_{0.05} = 0.27$

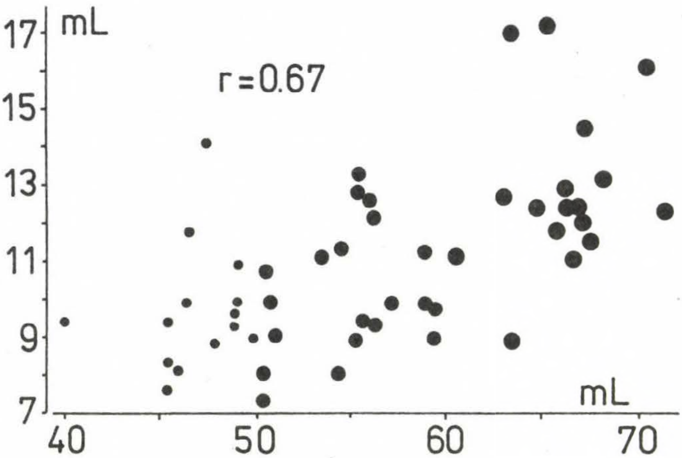

Fig. 2: Relationship between oxygen pulse (ordinate) and weight-related aerobic power (horizontal axis). $r_{0.05} = 0.27$

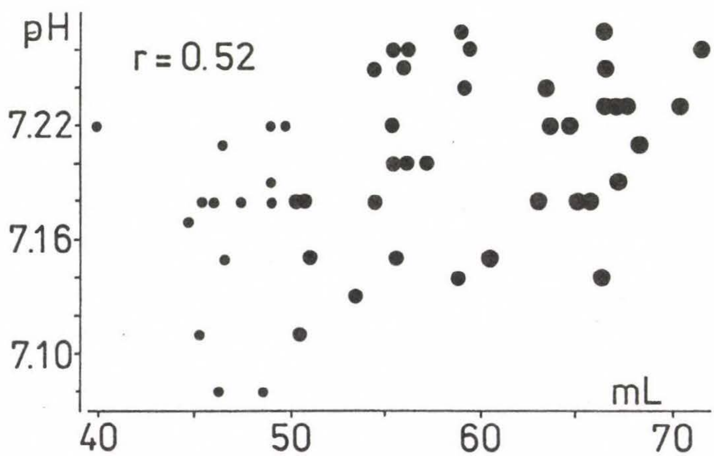

Fig. 3: Relationship between pH (ordinate) and weight-related aerobic power (horizontal axis). $r_{0.05} = 0.27$

The trainability of peak-exercise aerobic power and even its limits have been much better clarified than the basis of the often considerable interindividual differences (Malina 1980, Mészáros 1995, Wolanski 1980). Using twins in their study, Bouchard and associates (1991) reported that genetic factors accounted for about 75% of oxidative enzyme activity and that the trainability of aerobic power was about 25%. Frenkl and co-workers (1990) referred to the importance of regular physical activity, but also stressed the endogenous, so-called inherited limits imposed on the trainability of peak-exercise aerobic power.

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Anthrop. Közl. *38;* 87-91. (1996/97)

BODY COMPOSITION AND AEROBIC POWER OF QUALIFIED HUNGARIAN SOCCER PLAYERS

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Abstract: *The aim of the present study was to describe the anthropometric and exercise physiological attributes of League I Hungarian soccer players (n = 118) and to compare the characteristics of defenders, midfielders and forwards.*

Body build was estimated by Conrad's growth type indices (1963), relative muscle and fat masses were calculated as suggested by Drinkwater and Ross (1980). An all-out laboratory treadmill exercise test was carried out to determine the players' aerobic power.

No significant differences were observed among the mean anthropometric and exercise physiological characteristics of the three subgroups. The aerobic power of the Hungarian players was essentially smaller than that of the competitors of international level.

Key-words: *Conrad's growth type; Relative fat and muscle masses; Aerobic power; Soccer players.*

Introduction

Hungarian coaches have been of the opinion since long that anthropometric differences in the body dimensions and indices are of not much importance in this sport: "Advantages and disadvantages due to the players' differences in size and body proportions can be compensated if endowment is favourable and preparation is technically flawless". Perhaps it is not merely the missing success of Hungarian soccer that at least the coaches working with the much younger players have begun to reckon with such advantages that are due to physique, body composition and genetic endowment.

The purpose of the study was to disclose the prevailing situation, to point out the anthropometric indices and exercise physiological properties of League I players, to describe the similarities and dissimilarities associated with the position of the players in the field and, finally, to compare the obtained results to those expected by the coaches.

Subjects and Methods

Seven teams (N=118 adult males) of the 16-team Hungarian League I were studied between 1992 and 1995. The grouping criterion was the player's position in the field.

Group 1 consisted of the defenders (n = 34). In this position the expected properties are a stature markedly exceeding the male mean, a greater bulk of muscle, considerable robustness, and all these should associate with an appropriate level of motor abilities. Good performance would require good aerobic power, an above-average capacity to do anaerobic work several times in quick repetition, speed of running and explosive power.

Group 2 consisted of midfielders (n = 49). In this position athletes of various build and body structure can be efficient provided that their aerobic power gives a sound basis to build upon.

Group 3 consisted of forwards (n = 35). It may be favourable if the team has both taller and shorter forwards. A well-developed muscular system is an advantage in fighting for a better position, irrespective of body size. Forwards also need excellent aerobic power, but the ability to run very fast, to possess outstanding explosive strength may decide success and failure as in sprinters (Petrekanits 1986, 1995).

Body build (growth type) was assessed anthropometrically as suggested by Conrad (1963). In estimating muscle and fat percentages the body mass fractionation method of Drinkwater and Ross (1980) was used, while in taking body dimensions the suggestions of the International Biological Program (Weiner and Lourie 1969) were observed.

A Jaeger model μ-DATASPIR gas exchange analyser was used during the all-out treadmill exercise test. Following individual warming-up exercising began at 12 kmh belt speed on zero incline. Belt incline was then increased every second minute by 3% until exhaustion.

Intergroup differences between the means of the respective anthropometric and exercise physiological variables were tested at 5% by the F-test after one-way ANOVA.

Results and Discussion

Analysis of variance disclosed no difference in the anthropometric dimensions between defenders, midfielders and forwards. All of them were moderately tall with a proportionately larger body mass compared to Hungarian reference data (Eiben et al. 1992). They had a metromorphic and moderately hyperplastic growth type, but in skeleto-muscular robustness they were much below the players of international rank (Petrekanits 1995).

The observed mean fat percentages fell within the range of that found in elite athletes (Mészáros et al. 1994, Mohácsi et al. 1994, Petrekanits 1995), but marked standard deviations indicated that some of them belonged to the moderately fat category. A similarly broad variability was found in relative muscle mass, a fact that indicated that players having 44-45% of muscle mass were not exceptional in any of the three groups.

Considering that the sample embraced about 40% of the national elite ranks in soccer, one may state that all team parts fell behind the expectations of excellence formulated by the coaches concerning either body build or body composition.

By itself, the anthropometric similarity of the team parts would not be a too important disadvantage provided that the players' motor abilities, technical skill and physiological excellence could compensate for it. These properties were not a subject of this study, but the present low rank of Hungarian soccer in the international contests may qualify them, at least in part.

The observed peak-exercise parameters are shown in the last five rows of Table 1. Despite that most players continued exercising until complete exhaustion so their data could be taken as maximum values (cf. HR and R), we had to state with regret that none of their exercise physiological characteristics could be regarded as excellent. In our view it was relative aerobic power above all that lagged behind international standards.

Table 1. Subgroup means and standard deviations of the studied anthropometric and exercise physiological variables.

GROUP Variable	DEFENDERS Mean	 SD	MIDFIELDERS Mean	 SD	FORWARDS Mean	 SD	 P
CA	25.41	3.75	23.83	3.62	24.11	3.39	NS
BH	179.21	4.28	177.29	5.42	177.61	4.82	NS
BM	71.91	5.55	72.33	4.87	73.25	5.76	NS
MIX	-0.96	0.26	-0.93	0.31	-0.96	0.28	NS
PLX	87.71	2.36	86.72	2.06	87.75	2.13	NS
M%	47.15	1.28	47.31	1.55	47.08	1.21	NS
F%	9.85	1.73	9.60	1.84	9.88	1.66	NS
MV	127.95	20.42	130.86	17.55	130.20	17.40	NS
R	1.11	0.08	1.13	0.08	1.10	0.08	NS
HR	185.65	8.57	182.49	6.58	183.83	7.32	NS
O_2P	22.41	3.50	22.63	3.12	23.45	3.21	NS
RVO_2	57.85	9.04	57.10	7.88	58.84	8.05	NS

Abbr.: CA = calendar age (yr.), BH = height (cm), BM = body mass (kg), MIX = metric index (cm), PLX = plastic index (cm), M% = weight-related muscle mass (%b.w.), F% = weight-related fat content (%b.w.), MV = peak exercise minute ventilation (BTPS $L.min^{-1}$), R = respiratory exchange ratio, HR = heart rate bpm, O_2P = oxygen pulse ($ml\times beat^{-1}$), RVO_2 = aerobic power ($ml\times kg^{-1}\times min^{-1}$), N.S. = no significant difference between subgroup means.

Mean relative aerobic power was reported in Brazilian players by Flegner (1991), in international-rank athletes by Nieman (1995) and Petrekanits (1995) to range between 60 and 70 $ml.min^{-1}.kg^{-1}$, with considerably smaller variance than observed here. Greater aerobic power associated with very good anaerobic performance in all of them irrespective of team position, furthermore, Brazilian players only approached but did not exceed the anaerobic threshold in the first 1600 metres of their test run!

By the data of the present study it was not possible to decide whether moderate aerobic power in our players was attributable to central (cardiac) or peripheral (cellular) factors. Both have large individual variability and may lead to marked differences in maximum oxygen uptake (Fox and Mathews 1981, Mirwald and Bailey 1981). The observed oxygen pulse of about 22-23 $ml.beat^{-1}$ may be one of the explanations. After having reached real submaximum steady state even the well-conditioned heart is unable to further increase stroke volume so to achieve a higher oxygen pulse is hardly possible later. We therefore regard the observed oxygen pulse means as being below expectation.

The studied subjects had a mean training history of above 10 years, thus it can be rightly assumed that the training-dependent adaptive functional changes had already occurred in them. Accordingly, their exercise performance only approaches but does not reach even European mid-class level.

The post-related difference between the team parts was another expectation of the coaches that failed to get manifest in the study. Even the similarity of exercise performance could be accepted if the physiological background were more favourable. It is thought that all these facts are attributable to the now already out-of-date preparation of the young soccer generations. Hungary still has world champions in a number of sports though kayaking, canoeing or modern pentathlon requires markedly better physical and physiological power output than ball games. Thus it is almost certain that the reasons need not be sought in biology (to refer to the much aired opinion on the continuously decreasing physical fitness of the population). Instead, such reasons are most likely to be found in the outdated training methods of preparation.

Our final conclusion arrived at both by analyzing the present results and the performance of Hungarian soccer is rather unfavourable. Since the observed data refer to mature and settled athletes, no one may expect any remarkable change in either morphology or in the physiological properties. More attractive championship matches and more successful international performance can only be expected after a new generation of soccer players had grown up. Their preparation must rely on a carefully planned, objectively and regularly checked training process begun at a young age (considering international experience, at the age of 8 or 10 at the latest). Even then it would take long years until better performance gets manifest.

The emphasis in what was said is on the regularity of check-up. Physiological performance depends more on inherited factors (Bouchard et al. 1991, Klissouras 1971) than thought before. The theoretical occurrence of class I performers may be set to one per a thousand in the population while the occurrence rate of internationally successful performers is a mere 0.0001 provided that every healthy child aged 8 to 10 would choose soccer as their future field of exercise.

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Anthrop. Közl. *38;* 93-100. (1996/97)

ASSESSMENT OF BODY COMPOSITION OF PHYSICALLY ACTIVE MALE YOUTH

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Abstract: *Body composition assessment by skinfolds (SKF) and body mass index (BMI) was conducted on physically active males applying for admission to the Hungarian University of Physical Education to determine if BMI is a good indicator of percent body fat. The sample (N=203) was divided into four groups as follows: GR1 (N=46), those with BMI under 20.0; GR2 (N=43), with both height and weight ranges of 176.4-177.4 cm and 68.3-69.7 kg, respectively; GR3 (N=52), with BMI over 24.0; and GR4 (N=62), with BMI between 21.9 and 22.3. Although GR3 exhibited "undesirable obesity" according to BMI (mean=25.62) and was significantly different from the other groups (p<.05), percent fat predicted from SKF for GR3 and GR4 were statistically similar (p>.05). At the same time, GR2 and GR4 had similar BMIs but statistically different percent fat levels (p<.15). GR1, with the lowest BMIs, still showed significantly higher percent fat than GR2. Therefore, BMI in itself, is not necessarily a good predictor of percent body fat with college-age, physically active males.*

Key words: *Body composition; Physical activities.*

Introduction

The estimation of percent body fat for identification of obesity has been manifested by an assortment of techniques varying in cost, equipment, ease of use, and accuracy. While some methods are cost prohibitive to users, skinfold measurements and underwater weighing remain the most widely used assessment standards. From a strictly practical standpoint, anthropometric measurements using a reasonably accurate body mass index (BMI) is the most cost-effective approach.

A number of different BMI prediction indices have been cited in the literature (Lohman, 1992; Womersley & Dumin, 1977), including ratios of weight (W) to height (H), W to H^2, W to H^3, H to $W^{.33}$, and waist to hip circumference (WHR). The Quetelet index (W to H^2) is the most recognized body mass index (Nieman, 1995). This index represents body mass relative to linear growth; the higher the BMI score, the greater the inclination toward obesity. The Surgeon General's Report (U.S. Department of Health and Human Services, 1988) defines the "moderately obese" and "severely obese" risk categories for women as 27-32 and >32, respectively. For men, the corresponding values are 28-31 and >31. Other studies (Jequier, 1987; Lukaski, 1987) cite increased health risks associated with BMIs beginning in the range of 25-30.

Caution is in order when using body mass index as an indicator of obesity because it may not be appropriate with certain groups. The American College of Sports Medicine (1995) notes that "BMI is a relatively good indicator of total body composition in population-based studies." Investigations by Smalley et al. (1990) and Garn, Leonard, and Hawthorne (1986) reported correlations of 0.82 (women) and 0.70 (men) for BMI and densitometry and 0.65 for BMI and percent lean body mass, respectively. However, Lohman (1992) notes that BMI can be misleading, especially in populations experiencing rapid muscle and bone mass changes, i.e., in children and the elderly. This study looks at the relationship between BMI and percent fat and the predictive ability of BMI with respect to percent fat of physically active college age males.

Methods

Subjects

Data from a sample of 203 physically active males were drawn from individuals applying for admission to the Hungarian University of Physical Education from 1991 to 1995. The subjects were divided into four groups based on body mass index and according to height and weight. The four groups were as follows: Group 1 (N=46), lean subjects with BMIs under 20.0; Group 2 (N=43), medium height and weight subjects falling within the height range of 176.4-177.4 cm and weight range of 68.3-69.7 kg; Group 3 (N=52), "fat" subjects with BMIs over 24.0; and Group 4 (N=62), subjects with medium BMIs between 21.9 and 22.3.

The upper and lower limits for BMI for Group 4 (MED BMI) were established as (1.0 confidence interval at 95% from the normative data of Eiben et al. (1992) on 862 Hungarian male youths. Likewise, both height (176.4 cm to 177.4 cm) and weight (68.3 kg to 69.7 kg) criteria for Group 2 (MED HW) were established in similar fashion, that is, within ± 1.0 confidence interval. Subjects for Groups 1 and 3 (LEAN and FAT) were selected on the basis of two recognized BMI categories, that is, they tended to fall within the "lean, underweight" or "Grade 1 obesity" categories (Jequier, 1987).

Measurements

Measurement data are presented in Table 1. Anthropometric data (height, weight, chest depth, breadth and girth, shoulder width, arm and forearm girth, hand girth, thigh girth, and calf girth) and skinfold measurements were collected for each subject. Calculation of body density was based on measurements from the skinfold sites of biceps, triceps, subscapular, suprailiac, and calf, using Szmodis et al. (1976) modification of the equation of Parizkova (1961). The measurements were made by Lange calipers. Percent fat was derived from body density according to Brozek et al. (1963). Muscle mass, as a percentage of total mass, was calculated using the Drinkwater technique (Drinkwater & Ross, 1980) whereby the body is partitioned into four components of mass, i.e., skin and adipose tissue, muscle, bone, and residual. Equation 1 gives the muscle mass:

$$\text{Muscle mass (\%)} = r^2 \times \text{Stature} \times 6.41 \quad \text{(Eq. 1)}$$

$$r = [\text{arm girth}/3.14 - \text{triceps SKF}/10 + \text{thigh girth}/3.14 - \text{thigh SKF}/10$$
$$\text{calf girth}/3.14 - \text{calf SKF}/10 + \text{chest girth}/3.14 - \text{subscapular SKF}/10] \,/\, 8$$

In addition, two indices of physique - one to estimate degree of rotundness or mass per linear growth, and the other to estimate degree of muscle and bone development - were calculated according to Conrad (1963). These indices, identified as the Metric Index (MIX) and Plastic Index (PLX), respectively, are depicted in scatter plot form (Figure 1).

Table 1: Anthropometric and Body Composition Data*

	Group 1	Group 2	Group 3	Group 4
No. Subjects	46	43	52	62
Weight (kg)	63.76 (4.85)	69.13 (0.50)	82.02 (7.88)	70.88 (5.09)
Height (cm)	181.91 (4.71)	177.01 (0.28)	178.54 (6.78)	178.71 (6.16)
BMI (kg m-2)	19.24 (0.73)	22.06 (0.17)	25.62 (1.27)	22.10 (0.14)
Percent Fat (%)	11.92 (3.29)	10.91 (2.56)	13.42 (3.44)	13.03 (2.59)
Muscle Mass (%)	46.46 (1.48)	47.33 (1.59)	47.37 (1.73)	47.05 (1.57)
Metric Index	1.75 (0.31)	1.15 (0.35)	1.04 (0.40)	1.42 (0.31)
Plastic Index	86.25 (2.49)	87.37 (1.93)	91.10 (3.82)	87.72 (2.71)

*Mean and standard deviation (in parentheses)

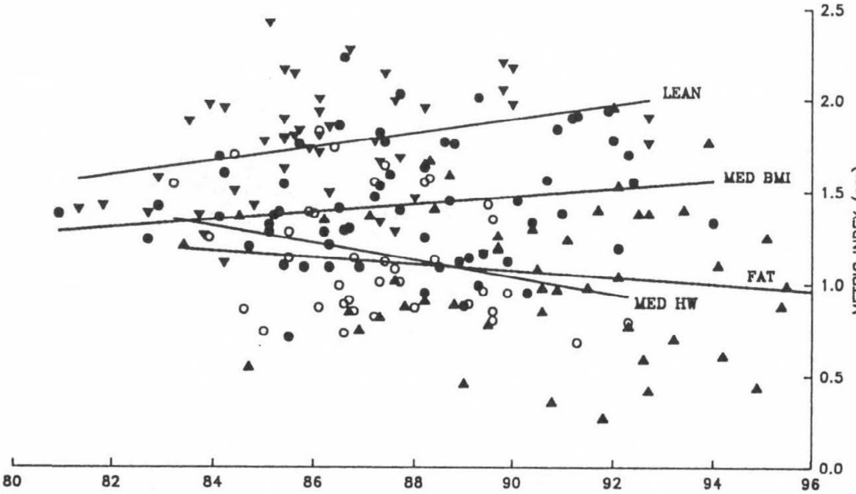

Fig. 1: Data points for metric index and plastic index for LEAN, MED HW, MED BMI, FAT.

Results

The relationship between body mass index and percent body fat for the our subject groups combined (N=203) was tested with the Pearson correlation coefficient. A significant correlation coefficient ($r=.251$, $t=3.68$, $p>.01$) was found to exist between BMI and percent fat. Viewed separately, the relationship between BMI and percent fat for each of the four groups was positive. Figure 2 shows the plotted points for the four groups. Groups 2 and 4 (MED HW and MED BMI, respectively) naturally demonstrate steeper slopes than the LEAN and FAT groups but upon closer inspection, their own slopes are similar (Figure 3).

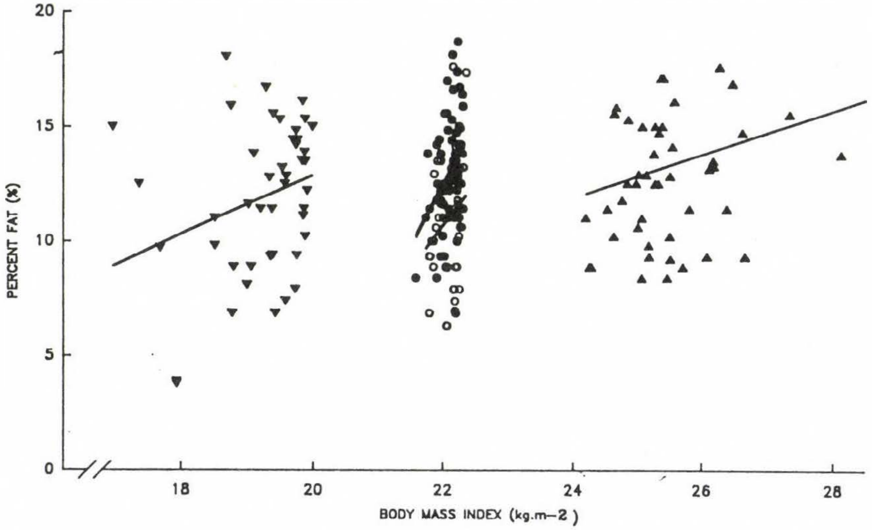

Fig. 2: Data points for body mass index and percent fat for LEAN, MED HW, MED BMI, FAT.

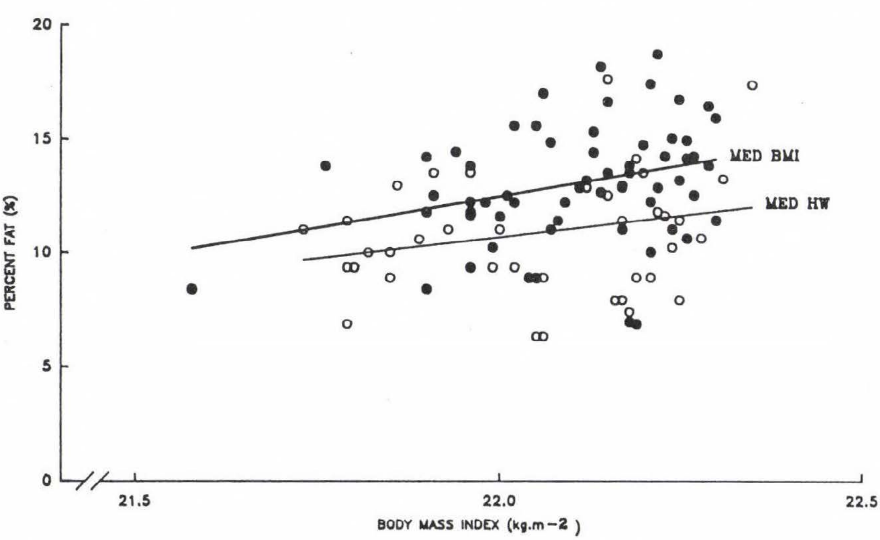

Fig. 3: Data points for body mass index and percent fat for MED HW and MED BMI.

Additional analyses demonstrate that other factors need to be taken into consideration with regard to the accuracy of body mass index. First, Group 3 (FAT), the group exhibiting the greatest tendency toward obesity (BMI mean = 25.62), was compared to the other groups. ANOVA revealed it to be significantly different ($F=610.94$, $df=3, 199$, $p<.05$) from each of the other groups, i.e., Group 1 (LEAN, BMI mean=19.24), Group 2 (MED HW, BMI mean=22.06), and Group 4 (MED BMI, BMI mean=22.08) (see Table 2). Yet, at the same time, percent fat for Group 3 (FAT) and Group 4 (MED BMI), 13.42% and 13.03%, respectively, were statistically similar ($p>.05$).

Secondly, while a non-significant difference ($p>.05$) was found between BMIs of Group 2 (MED HW, mean=22.06) and Group 4 (MED BMI, mean=22.08), analysis by ANOVA ($F=6.91$, $df=3, 199$, $p<.05$) and Scheffe ($F=3.83$, $df=3, 199$, $p<.01$) revealed a significant difference between the two groups for the variable of percent body fat (see Table 3).

Finally, Group 1 (LEAN), the group with the lowest mean BMI (19.24) and statistically different from Group 2 (MED HW, mean=22.06), nevertheless demonstrated a higher percent body fat (mean=11.91%) compared to the latter group (mean=10.91%).

Discussion

This investigation sought to examine the relationship between percent body fat, as calculated from skinfold measures, and a specific body mass index, the Quetelet Index. Because body mass indices, including the one used here, depend on weight and height, the use of BMI to estimate percent body fat is often subject to error. A major drawback in using weight (in a BMI equation) to represent body mass is that it inadequately discriminates the varying proportions of fat, muscle, and skeletal mass in many subjects.

In this investigation of athletes and physically active males, a low but significant correlation ($r=.15$, $t=2.15$, $p<.05$) was found between BMI and percent muscle mass. The determination of muscle mass using girth and skinfold measurements (Drinkwater & Ross, 1980) resulted in percent muscle masses of 46.46%, 47.33%, 47.37%, and 47.05%, respectively, for the four subject groups. The values of the latter three groups were statistically similar ($p<.05$). That, in spite of the finding that Groups 2, 3, and 4 are statistically different ($p<.05$) with regard to percent fat. Naturally, muscle mass and percent fat are negatively related (Figure 4). In this study, a much stronger relationship ($r=-.519$, $t=-8.60$, $p<.001$) existed between muscle mass and percent fat that between BMI and percent fat ($r=.250$) (Figure 5).

It is also apparent that BMI is more strongly related to each of the anthropometric indices, MIX-Metric Index and PLX-Plastic Index, than to percent fat. A significant relationship ($r=-.570$, $t=-.9.84$, $p<.001$) was found for BMI and MIX. For BMI and PLX, the correlation coefficient was $r=.583$ (t(10.18, $p<.001$). Graphically, the relationship between BMI and MIX is presented in Figures 6 and 7.

The use of height and weight and other anthropometric measurements has its place for yielding descriptive data on body build and composition. Body mass index, as shown here, demonstrated high correlations with both MIX and PLX, anthropometric indices for body rotundness and bone/muscle development, respectively. To a much lesser extent, BMI was shown to correlate with percent fat. In addition, separate ANOVA analysis of BMI and percent fat revealed that BMI alone, is not necessarily a good predictor of percent body fat with college-age, physically active males.

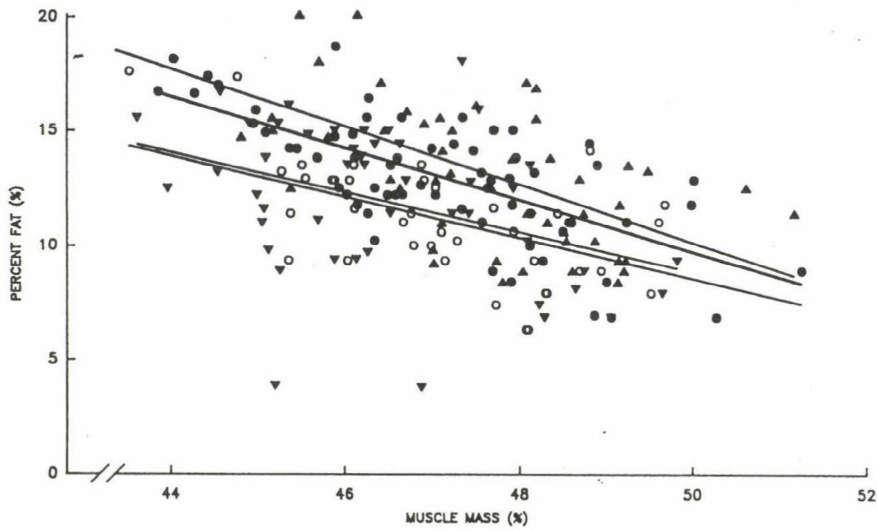

Fig. 4: Data points for muscle mass and percent fat for LEAN, MED HW, MED BMI, FAT.

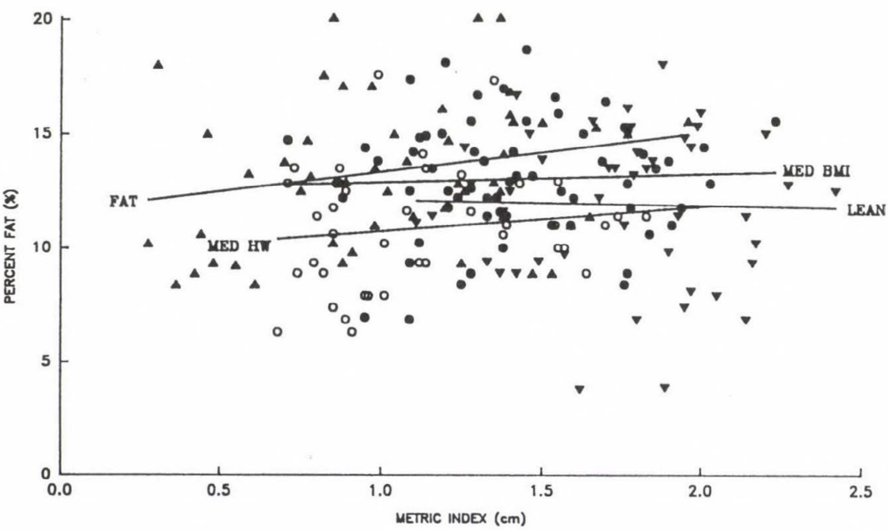

Fig. 5: Data points for metric index and percent fat for LEAN, MED HW, MED BMI, FAT.

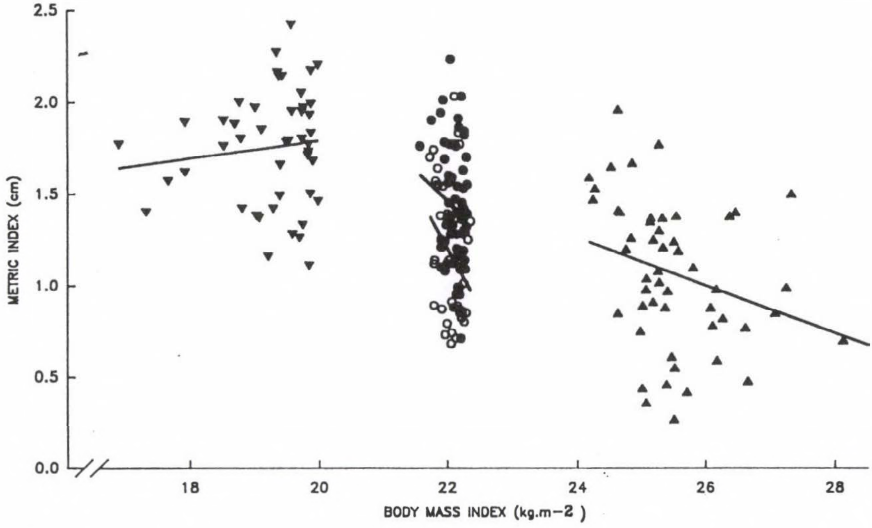

Fig. 6: Data points for body mass index and metric index for LEAN, MED HW, MED BMI, FAT.

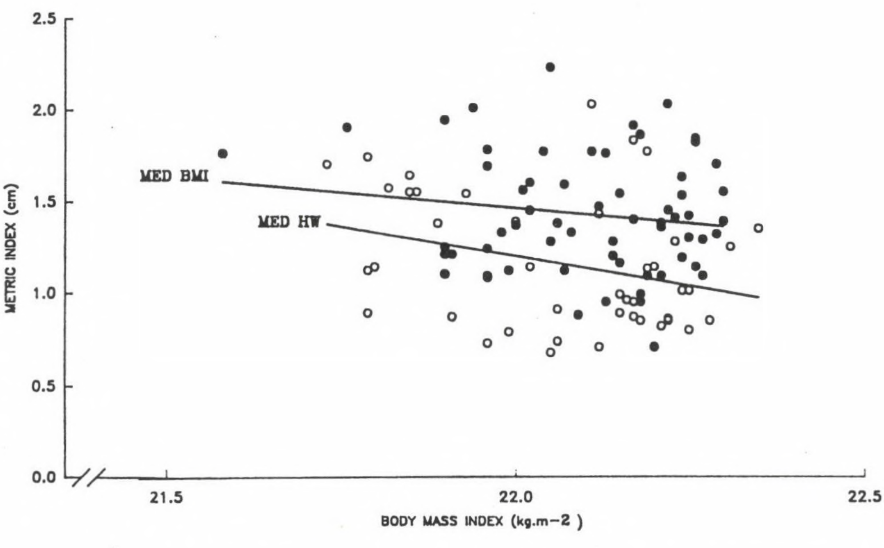

Fig. 7: Data points for body mass index and metric index for MED HW and MED BMI.

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Anthrop. Közl. *38;* 101-105. (1996/97)

THE EFFECT OF PHYSICAL TRAINING ON BONE DEVELOPMENT OF JUDOISTS AND CYCLISTS

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Abstract: *Bone development (width of the epicondylus of femur and humerus) as well as other anthropometric parameters of judoists and cyclists at the age of 14 to 26 years were measured to determine the development of the muscular and the skeletal system of sports with different physical loads. The sample (n=79) was divided into 3 age groups.*

According to the different physical load of the upper body the humoral width of judoists is significantly wider (p=.02) than the one of the cyclists within the age group number 3 (21 to 26 year old athletes). There was no significant difference for the younger age groups. BMI as well as the mesomorphy (Heath & Carter) show a significant difference for the age group number 2 (16 to 21 year old athletes) and 3.

Key words: *Bone development; BMI. Mesomorphy; Judoists; Cyclists.*

Introduction

The increase in the width of bones carries on for life. Continuously apposition and deposition are determined by the function of the bones. Appropriate to the forces of compression, rotation, shearing force and traction bones get their characteristics and shape. In the course of time the shape of bones changes to the actual optimum. This is reached when the bone has developed a structural and functional balance. The functional stimulation for the increase in width is given either by the physical load or by the traction of the active locomotor system.

Training represents a high load for muscles, tendons, ligaments and bones. The muscular system is highly adaptable to work load. A strong muscular system results in a high traction to the bones. The consequence is an increase in width.

Subjects and Methods

The study was carried out with athletes of the Austrian national cadre (n=79, thereof 26 judoists and 53 cyclists) and young athletes from the Federal Sports Centre in Südstadt (n=13, thereof 7 judoists and 6 cyclists). At this centre talented young athletes are trained and coached. The athletes are omitted to the entrance examination at the age of 13 to 15 years and stay in the sports centre for 5 years at least. During this period the athletes are checked medically, motoricly and anthropometricly in regular intervals. In this way the development of the athletes can be followed.

The purpose of the study was the examination if specific training has an influence on bone development, the extend of this influence and the age at which the development starts. According to the connection of muscular load and development of bones, it can be concluded that sports which include high forces show a more pronounced muscular and skeletal system than types of sport with low force elements. We tested judoists and cyclists.

Judo is characterized by high force, power endurance and muscular endurance elements, whereas cycling primarily requires a high level of endurance and muscular endurance. The weight of the cyclist is supported by the bike and the muscular load is concentrated to the lower extremities.

With respect to the different physical loads of judo and cycling, it can be asserted, that there is a difference in the development of the muscular and the skeletal system. The difference gains importance with the increase of specific training and it is marked stronger at the arms than at the legs.

If the stimulation of the skeletal system is too high during the adolescent period and there is not enough time for forming an adequate structure of bones, the skeletal system will not be able to sustain the load. The danger of bone damage becomes higher.

Realisation of the study: The study was carried out between 1992 and 1995. The following anthropometric parameters were measured: body weight, body height, diameter of the humoral condyles and diameter of the femoral condyles. For the mesomorphy after Heath/Carter the following parameters were determined: circumference of the upper arm, circumference of the calf and skinfolds at the triceps and the calf. The mesomorphy is part of the determination of the constitution at the body and represents the muscular and skeletal development.

Results and Discussion

Comparison of anthropometric parameter from judoists and cyclists belonging to the national team:

In order to measure the influence of specific training to the development of the skeletal and muscular system the Austrian athletes were divided into three groups: G 1: 13.0 to 15.99 years (comprises 12 judoists and 22 cyclists); G 2: 16.0 to 20.99 years (comprises 8 judoists and 24 cyclists); G 3: 21.0 to 25.99 years (comprises 6 judoists and 7 cyclists).

Figure 1 shows the comparison of humeral and femoral diameter as well as the mesomorphy and the body-mass-index of judoists and cyclists of the three groups. It can be recognised that the average diameter of the humerus of judoists and cyclists in the first age group is the same. In both types of sport the diameter increases from one group to the next, but the diameter of the judoists increases more than that of the cyclists.

In the first age group the diameter of the femur of the cyclists is bigger than that of the judoists. Whereas the femoral width of the judoists is growing continually, that of the cyclists stagnates. In the last age group it is even thinner than it is in the second one. The reason of the stagnation in growth may be the early adaptation of the bones to the extensive amount of training of cyclists which has been performed in the early stages of the training process.

While judoists show a constant increase of the mesomorphy, the level of mesomorphy of the cyclists decreases a little bit from one age group to the next one. It can be supposed, that this fact is connected with the rather small number of athletes in this group as well as in general.

The first level of the body mass index is the same for both types of sport. The index increases from one age group to the other, but in judo the progress of the index is higher. That means that judoists are heavier per centimetre of their body height than cyclists.

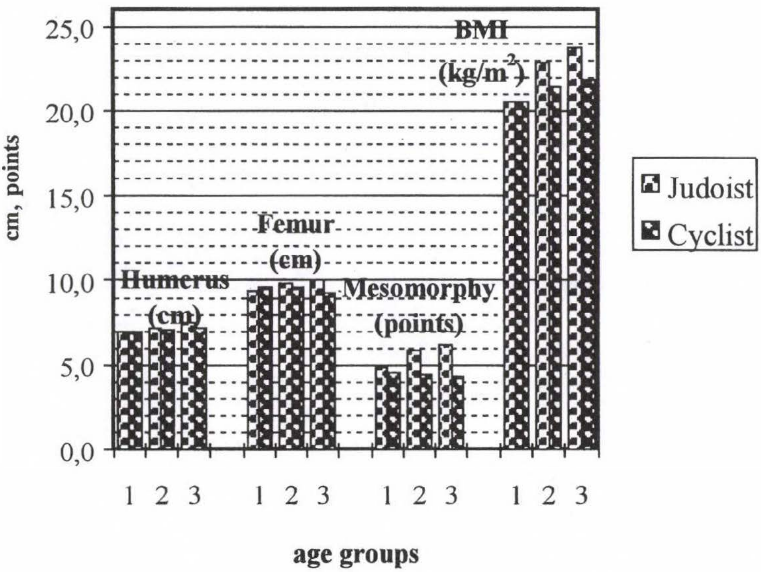

Fig. 1: Comparison of Humoral and Femoral Width, Mesomorphy and Body-Mass-Index of Judoists and Cyclists

The statistical test of the anthropometric parameters was carried out by a T-test for unpaired random samples (Table 1). In the age group of the 13 to 16 year old athletes none of the parameters differs significantly. In the group of the 16 to 21 year old athletes the difference of the mesomorphy is highly significant (p=.00). That means that the judoists have a clearly better developed skeletal and muscular system. The comparison of the third age groups shows a high significant difference of the mesomorphy (p=.00) as well as a significant difference of the humoral diameter (p=.02) and the body mass index (p=.01). Judoists have a wider humerus condylus and they are heavier in relation to their height as their cycling colleagues.

Table 1: Results of the T-test for unpaired random samples of different anthropometric parameters.

Age group	Sport	Weight (kg)	Height (cm)	BMI (kg/m^2)	Hum.width (cm)	Fem.width (cm)	Meso-morphy
1	Judo	59.4	169.3	20.6	6.9	9.4	4.8
	Cycling	60.5	171.2	20.6	6.9	9.6	4.5
p		*.89*	*.42*	*.44*	*.52*	*.95*	*.06*
2	Judo	69.4	173.9	22.9	7.2	9.8	5.8
	Cycling	67.8	178.1	21.4	7.1	9.6	4.4
p		*.50*	*.06*	*.02*	*.16*	*.49*	*.00*
3	Judo	75.7	178.2	23.8	7.5	10.0	6.2
	Cycling	70.4	179.2	21.9	7.2	9.4	4.3
p		*.12*	*.67*	*.01*	*.02*	*.19*	*.00*

Conclusion:

With respect to the higher part of force in judo the mesomorphy is more developed in comparison with cycling.

According to the different physical load of the upper body, the humeral width of judoists is better developed than the one of the cyclists. The difference of the lower body between judoists and cyclists is less than that of the upper one.

The differences between judoists and cyclists becomes more evident with the increase of the specific training. This fact can be seen especially at the mesomorphy.

Comparison of the development of young judoists and cyclists:

The first assessment of the anthropometric parameters shows that weight and height as well as humeral and femural diameter of judoists and cyclists have nearly the same extension. The difference of mesomorphy is 0.3 points but is not significant.

After 1.6 years the judoist have been tested again after 1.8 years the cyclists. During this period the increase of the femur was equal for both types of sport. The diameter of the humerus of judoists grew 0.3 cm that of cyclists 0.2 cm. The augmentation of the mesomorphy of judoists is 0.7, that of cyclists 0.3. It can be supposed that the differentiation of bone development will occur at a later period.

The difference between the mesomorphy of judists and cyclists increased since the first study and is now 0.8 points. There is no significant difference neither for the mesomorphy nor for other parameters.

Conclusion of the athletes from the federal sports institute:

The skeletal system of both types of sport is equal at the entrance examination as well as at the second study. According to the general training at the federal sport centre the bone development of judoists and cyclists is proceeds parallel.

A remarkable - but not significant difference - can be seen for the muscular growth. The muscular development is in advance of the skeletal growth. It can be admitted that this process occurs at the selected age groups and that the augmented development of the skeletal system will happen in the following years. Changes will be examined at further investigations.

Although the skeletal development lags timely behind (that means a higher risk for overload bone damage) no overload damage is known at the Federal Sport Institut. The training load complies with the morphological development of the athletes.

Notes:

The author is aware of the fact that the number of measured athletes is too small to do a statistically well founded declaration. Therefore a bigger sample as well as a longitudinal study would be necessary. In that sense this study could be noted as a first approach to the problem. A continuation of the study is planned.

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Anthrop. Közl. *38;* 107-110. (1996/97)

SOME FEATURES OF BODY DEVELOPMENT AND MOTOR PERFORMANCE WITH KINDERGARTEN CHILDREN IN VESZPRÉM

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Abstract: *A most complex study on the biological development and physical fitness of Hungarian youth was carried out by Eiben, Pantó and Barabás (1991) during the past decades.*

Continuing the studies carried out in Hungary previously, the authors present data on growth, bodily development and motoric performance of 3 to 6 year-old children in a nursery school providing a multi-movement play program (STJ). There is a considerable advantage in physical fitness as opposed to children not taking part in STJ.

Key words: *Growth and development; Kindergarten children; Veszprém*

Introduction

Few researchers have studied the body development and motor performance of kindergarten children so far. Hungarian and foreign specific literature has no abundance of studies of the growth, body development and motor performance of children of 3 to 6 years of age. The majority of the existing studies merely hint at the kindergarten age group when thoroughly analysing the data on the age group 0 to 18 or 6 to 18.

Study findings on the body and mental development of 3 to 6-year-old children were first published in Hungary in the journal "Kisdednevelés" (1933) by Kenyeres. A more significant anthropometric study of 3 to 18-year-old children was carried out in Kaposvár by Véli (1936), and then in Budapest by Mrs. Mentusz (1952).

A most thorough growth study of Budapest kindergarten and school children was carried out by Eiben and his colleagues in the late 1960s (1971). They calculated the reference values on body height and body mass for boys and girls of 3 to 18 years of age (Eiben and Pantó 1986), based on their nationwide survey of Hungarian population, involving 41000 people of 3 to 18 years of age, which is 1.5 per cent of the total population concerned.

The growth of kindergarten children was measured, among others, by Bakonyi (1981) and in Veszprém by Győri (1991) and by Győri and Völgyesi (1988).

Subjects and Methods

At the Department of Physical Education of the University of Veszprém the biological development and motor performance of 3 to 6 year old children have been studied since 1983. The measurements carried out every six months involved 18 measurements or calculated body measurements.

In every school year some 100 to 120 kindergarten children took part in the multi-movement physical education (P. E.) game program worked out by us. Its essence is that they carried out, P.E. games including intensive multi-movements and running on a weekly 2xl hour basis for 8 months. Their development was measured by motor tests (dynamic strength, speed, stamina and coordination). The number of these tests was 18 and they proved suitable for this age group. The measured data, the body development, body height and body mass average figures of 4 to 6-year-old children are used as representative figures.

Out of the motor tests, we laid emphasis on the 3 most representative skills and measurements. Speed strength was measured by standing jump, speed by 20-metre run and stamina by the Cooper test. The kindergarten children showed extraordinary results in these skills.

A longitudinal examination was carried out for a period of four terms including experimental (52 boys and 54 girls participating in the multi-movement P.E. game program) and control groups (30 boys and 29 girls participating in traditional kindergarten programs).

At the time of the beginning of the examination, considering their decimal age, they were 4,5 years old (±3 months).

Results and Discussion

The body height of children measured by us was not significantly different from the national average or from that measured in Veszprém county by Eiben et al (1990).

In the experimental group only slight differences were detected between the sexes while at the age of 4.5 to 5 with boys and 5.5 to 6 with girls there occurs a fast (abrupt) growth stage which is followed by boys with some half a year's delay (Table 1).

Table 1: Mean values of body height, body mass and roundness relative index with Veszprém kindergarten children

Group		N	Body height 1	2	3	4	Body mass 1	2	3	4	Roundness rel. index 1	2	3	4
							BOYS							
TG	M	52	113	114	116	119	20	20.8	21.6	22.9	5.64	5.47	5.36	5.17
	S		2.65	3.83	4.85	4.91	2.28	1.99	2.83	2.87				
CG	M	30	107	112	116	118	18.8	19.5	20.5	21.3	5.69	5.74	5.68	5.52
	S		4.77	4.74	4.1	4.7	1.74	1.53	3.56	2.15				
							GIRLS							
TG	M	54	110	114	117	119	18.9	19.8	21.3	22.4	5.84	5.75	5.49	5.29
	S		3.74	2.85	5.41	5.13	2.03	1.84	2.27	2.51				
CG	M	29	111	115	117	117	19.5	20.4	21.6	22.1	5.7	5.61	5.39	5.32
	S		4.03	4.14	4.14	4.59	2.47	3.38	3.37	3.22				

Comment: group 1- age 4.5 years, group 2 - age 5 years, group 3 - age 5.5 years, group 4 - age 6 years, TG - testgroup, CG - controlgroup

No significant difference was found in the mean values between the experimental and the control group, whether with boys or girls (there was a significant difference at the first measurement only).

The body mass of children measured by us was, with both sexes and every age group, bigger than the national or Veszprém county average values. The body mass increased in two years 2.94 kilos with boys and 3.56 kilos with girls. The growth rate with boys was 14.73 % and with girls it was 18.85. The body mass of boys in the control group at all four measurements was significantly less than that of the girls. The growth rate of boys was 13.22 % and in girls it was 12.95 %, which is less for both sexes than in the experimental group. Analysing the body mass of the experimental and control groups it can be stated that a significant difference was found in boys belonging to the experimental group in all four measurements, while in the girls there was a significant difference at a 1 % level only at the first measurement.

From the measured values we calculated a roundness relative dimension following the method described by Eiben et al (1971). The rate of body height for l kilo of body mass in the experimental group was less with boys than with girls in all four measurements. The girls in the experimental group showed more roundness in measurements 1 to 3 than the girls in the control group, but the values decreased with every measurement.

During the fourth measurement a higher value of roundness was shown by the girls in the control group. A similar tendency was detectable with boys too. The growth in roundness can be interconnected with a decreased possibility in exercise. It was also taken into consideration that, as a result of sexual dimorphism, roundness values typical of girls can be detected as early as 5 to 6 years of age.

Analysing the results with motor skills, it can clearly be stated that the boys and girls in the experimental groups showed signs of an intensive growth from measurement to measurement and surpassed in every respect the performance of children of both sexes in the control group. And it is not by chance as the multi-movement games favoured by children greatly develop dynamic strength, movement speed and stamina (Table 2).

Table 2: Average values of standing jump, 20 metre run and 12 minute run with Veszprém kindergarten children

Group		N	Standing jump				20 metre run				12 minute run			
			1	2	3	4	1	2	3	4	1	2	3	4
							BOYS							
TG	M	52	103	108	122	125	5,44	5,34	4,9	4,76	1541	1661	1729	1865
	S		19,6	16,1	14,7	18,3	0,5	0,4	0,44	0,48	243	109	246	255
CG	M	30	98	104	114	115	6,08	5,69	5,48	5,23	1430	1531	1576	1602
	S		18.5	11.1	12.2	12.5	0.57	0.39	0.48	0.41	223	257	261	275
			n.s.	n.s.	1%	1%	0,1%	0,1%	0,1%	0,1%	5%	0,1%	1%	0,1%
							GIRLS							
TG	M	54	102	104	120	124	5,53	5,32	4,92	4,82	1489	1596	1645	1772
	S		13,3	15,9	16,4	14,5	0,49	0,41	0,5	0,42	163	150	157	165
CG	M	29	96,2	103	110	114	5,92	5,69	5,52	5,35	1350	1409	1485	1548
	S		14,2	10,6	10,3	10,3	0,55	0,38	0,35	0,38	194	172	177	186
			5%	n.s.	0,1%	0,1%	0,1%	0,1%	0.1%	0,1%	0,1%	0,1%	0,1%	0,1%

Comment: group 1- age 4.5 years, group 2 - age 5 years, group 3 - age 5.5 years, group 4 - age 6 years, TG - testgroup, CG - controlgroup

In standing jump which develops the dynamic strength of legs, the boys showed better results in both groups than girls, moreover the average values with the girls in the experimental group were better than those of the boys in the control group. The difference between the two groups of both sexes was less at measurements 1 and 2 (in general 3-5 cm), which significantly increased at measurements 3 and 4 (in general 8-10 cm) and showed significant differences (0.1 %).

In 20 metre run representing speed, similar tendencies were detectable in both groups, which means that no significant difference was found between the two sexes. But quite significant differences were found in all four measurements in favour of the experimental group (0.1 %). This also proves that multi-movement P.E. games, race situations, runs of varied intensity, quick changes of direction, starts and stops considerably develop children's speed.

To measure long distance stamina we used, almost uniquely, the Cooper test. A significant development was achieved both by boys and girls of both groups. The mean value for boys within their own group was higher than that for girls. The performance of the girls in the experimental group significantly surpassed that of the boys in the control group. Between the two groups, quite considerable differences were found in favour of the boys and girls in the experimental group.

On the whole, the biological development of these kindergarten children corresponds to the national and Veszprem county mean values measured by Eiben et al (1990). At the same time, the development of their motor skills has proved more intensive. There was an especially significant difference between the 4 to 6 year-old children in the experimental and control group, clearly in favour of the children doing the multi-movement P.E. games.

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Anthrop. Közl. *38;* 111-117. (1996/97)

PHYSICAL GROWTH, BODY MASS INDEX AND AGE INDEPENDENT ANTHROPOMETRIC INDEX OF INDIAN CHILDREN

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Abstract: *Patterns of growth in height, weight, upper arm girth and body surface area of 3286 boys and 3368 girls aged 9 -17 years studying in public schools, central schools and government schools in Delhi are presented. In all the age groups, boys as well as girls of public schools showed larger mean values of height, weight, upper arm girth and body surface area than those of their coevals of central schools and government schools. Data on age at appearance of puberty signs of boys and girls are also reported. Mean age at menarche of girls of public schools, central schools and government schools was 12.68 SD 1.02; 13.28 SD 1.04; and 13.40 SD 1.21 years respectively. Mean values and SD of body mass index and $\sqrt[3]{weight}/height$ index of boys and girls are also reported. Body mass index increased with increase in age in both sexes $\sqrt[3]{weight}/height$ index did not increase or decrease with age. $\sqrt[3]{weight}/height$ is, age independent anthropometric index and its significance and practical importance in nutrition studies is discussed.*

Keywords: *Physical growth; BMI; $\sqrt[3]{weight}/height$; Puberty sings; Socio-economic factors.*

Introduction

The object of the present paper is: 1) to report patterns of growth in height, weight, upper arm girth and body surface area of children of 3 different socio-economic groups; 2) to present the data on age at appearance of puberty signs of boys and girls of different socio-economic groups and , 3) to present data on body mass index and $\sqrt[3]{weight}/height$ index of children of different age groups of different socio-economic groups.

Material and Methods

3286 boys and 3368 girls from various public schools, central schools and government schools located in different part of Delhi and New Delhi formed the subjects of the present study. Their ages ranged from 9 to 17 years. Children of elite of the society belonging to high socio-economic group attend the public schools. They have good diet and nutrition and enjoy optimum living conditions. Children of government servants / officers including children of army personnel who have transferable jobs get admission in the central schools, whereas children of general cross section of the population attend the government schools. The economic status of the parents of the children of central schools was lower than those of their coevals of public schools. Their economic status was more or less similar to those of their coevals of government schools, but the level of education of the parents of children of central schools was better than those of their coevals of government schools. From every school selected for the present study, a sample of children was examined and the method followed for sampling was that of ICMR (1972).

Body measurements. Standardised measurements of height, weight and upper arm girth were obtained for each subject using standard methods. Body weight was obtained with 'Prince' lever actuated balance and due reduction was made for clothing.

Surface area of the body was calculated for each subject using the following formulae : Surface area $(m)^2$ for men (vide Banerjee and Sen 1955) =

$$= \frac{\text{Weight(kg)}^{0.425} \times \text{Height(cm)}^{0.725} \times 74.66}{10{,}000}$$

Surface area $(m)^2$ for women (vide Banerjee et al. 1958) =

$$= \frac{\text{Weight(kg)}^{0.425} \times \text{Height(cm)}^{0.725} \times 78.28}{10{,}000}$$

Puberty signs. For each boy, the presence or absence of pigmented hair in the axilla and pigmented hair on the upper lip, chin and cheek were recorded. For girls, the presence or absence of axillary hair was noted. Information on whether each girl had experienced menarche or not was also recorded. Probit analysis was done for calculating the mean age at appearance of puberty signs. Statistical analysis of the data was done at Delhi University Computer Centre using SAS package.

Results

In all the age groups boys and girls of public schools showed greater mean values of height, weight, arm girth and body surface area than those of their coevals of central schools and government schools. Children of government schools showed the lowest mean values of these measurements. Measurements of children of central schools were in between those of their coevals of public schools and government schools but were closer to the measurement of the children of government schools. [Due to limitation of space, mean and SD of body surface area only are presented here (Table 1).]

Sex difference in body measurements was also observed. Girls were taller than boys during 10 -12 years of age. Body weight was greater in girls from 10 -13 years while arm girth was greater in girls during 10 -14 years. Body surface area was greater in girls than those of boys during 10-13 years (Table 1). In all other age groups, boys showed greater mean values of body measurements.

Puberty signs. Mean values and SD of age at appearance of puberty signs of boys and girls and age at menarche of girls are presented in Table 2. Pigmented hair in the axilla and pigmented hair on the upper lip, chin and cheeks appeared earlier in boys of public schools than those of central schools and government schools. Pigmented axillary hair in girls also appeared earlier in case of girls of public schools than in those of their coevals of central schools or government schools (Table 2).

Table 1: Mean and SD of body surface area $(m)^2$ of boys and girls of different schools

Sex and age group (years)	Public schools			Central schools			Government schools		
	N	Mean	SD	N	Mean	SD	N	Mean	SD
Boys									
9	87	1.07	0.10	108	1.03	0.08	118	1.02	0.12
10	144	1.16	0.14	101	1.07	0.09	124	1.06	0.10
11	121	1.25	0.14	101	1.13	0.10	164	1.14	0.13
12	178	1.33	0.16	100	1.27	0.16	175	1.19	0.11
13	155	1.46	0.16	112	1.37	0.14	186	1.33	0.17
14	155	1.57	0.18	103	1.48	0.17	159	1.43	0.17
15	120	1.67	0.16	101	1.60	0.13	150	1.54	0.15
16	84	1.72	0.13	98	1.64	0.15	165	1.64	0.13
17	54	1.78	0.17	31	1.69	0.14	90	1.62	0.11
Girls									
9	108	1.12	0.13	98	1.07	0.12	118	0.99	0.12
10	121	1.24	0.14	100	1.14	0.12	174	1.13	0.12
11	131	1.32	0.15	99	1.25	0.15	166	1.23	0.14
12	142	1.45	0.16	100	1.33	0.14	189	1.31	0.15
13	117	1.52	0.13	101	1.43	0.13	199	1.40	0.15
14	134	1.57	0.14	100	1.50	0.12	213	1.45	0.12
15	117	1.59	0.13	97	1.53	0.11	213	1.50	0.11
16	109	1.61	0.10	93	1.55	0.11	170	1.51	0.11
17	53	1.59	0.10	22	1.53	0.10	84	1.52	0.12

Table 2: Mean and SD of age (years) at appearance of puberty signs in boys and girls of different schools

Sex and Puberty Sign	Public schools		Central schools		Government schools	
	Mean	SD	Mean	SD	Mean	SD
Boys						
Axillary hair	11.49	1.36	12.70	0.84	12.82	1.25
Upper lip hair	11.59	1.51	13.02	0.82	13.17	1.44
Chin hair	14.40	0.91	14.66	0.94	15.22	1.24
Cheek hair	14.76	1.00	15.29	0.86	15.68	1.53
Girls						
Axillary hair	10. 79	1. 05	11.22	1.10	11.61	1.20
Menarche	12.68	1.02	13.28	1.04	13.40	1.21

Body Mass Index (BMI). Weight (kg)/Height (m^2). Body mass index increased with age in both sexes. It was interesting to note that girls showed greater values of mean as well as centiles of BMI than those of the boys of the same age groups. (Table-3). [Due to limitation of sapce, the mean values and centiles of BMI of children of public schools only are given here (Table 3)]

Table 3: Mean, SD and selected centiles of body mass index (kg/m^2) of boys and girls of public schools

Sex and age group (years)	Mean	SD	Centiles 5th	10th	25th	50th	75th	90th	95th
Boys									
9	15.7	2.2	13.3	13.5	14.3	15.1	16.5	18.3	20.8
10	16.4	2.6	13.2	13.7	14.5	16.0	17.5	20.6	22.7
11	16.9	2.7	14.1	14.4	15.0	16.1	18.1	20.8	22.8
12	17.5	2.8	13.8	14.4	15.5	16.8	19.2	21.4	22.8
13	17.7	2.8	14.0	14.6	15.8	17.2	19.3	21.1	23.5
14	18.3	2.8	14.6	14.9	16.0	17.8	19.5	22.4	23.9
15	19.1	3.1	15.3	15.7	16.9	18.5	20.9	23.5	25.3
16	19.7	2.9	15.3	16.2	17.6	19.4	21.0	24.4	26.0
17	20.6	3.4	15.9	16.7	18.0	19.9	23.2	25.8	27.2
Girls									
9	15.9	2.2	12.6	13.4	14.4	15.5	17.4	18.6	20.0
10	16.6	2.7	13.1	13.6	14.8	16.3	17.9	20.0	22.2
11	17.3	2.7	13.4	14.1	15.4	16.8	18.7	21.1	22.6
12	18.4	2.8	14.4	14.9	16.0	18.0	20.1	22.6	24.1
13	19.0	3.1	14.8	15.5	17.0	18.6	20.6	22.3	25.4
14	19.4	3.1	15.8	16.3	17.1	18.9	21.1	23.7	25.5
15	19.8	3.1	15.6	16.3	18.0	19.4	21.4	24.4	25.2
16	19.7	2.1	16.4	17.0	18.1	19.7	21.4	22.4	23.4
17	19.6	2.2	16.6	17.1	18.0	19.1	21.0	22.3	23.9

Mean values and centiles of BMI of boys as well as girls of public schools were greater than those of their coevals of central schools and government schools.

$\sqrt[3]{\text{weight}}$/Height (m) Index. It was interesting to note that the mean values of $\sqrt[3]{\text{weight}}$/height index were identical (2.2) in all the 9 age groups of boys as well as girls of central schools. Boys and girls of public schools and government schools also showed almost identical values in different age groups. The $\sqrt[3]{\text{weight}}$/height, could therefore be considered as age independent anthropometric index.

It was interesting to note that the mean values of this age independent anthropometric index tended to be somewhat greater in children of public schools than those of their coevals of central schools and government schools.

Values of SD of $\sqrt[3]{\text{weight}}$/height were identical (0.1) in all the 9 age groups of boys as well as girls of public schools, central schools and government schools.

Mean value, SD and selected centiles of $\sqrt[3]{\text{weight}}$/height of boys and girls of public schools are presented in Table 4. Value of 5th centile of this index was identical (2.1) in all the age groups of boys and girls. Similarly the values of other centiles were also identical in all the age groups. (Table 4).

Table 4: Mean, SD and selected centiles of $\sqrt[3]{\text{weight}/(\text{kg})}$/height (m) of boys and girls of public schools

Sex and age group (years)	Mean	SD	Centiles 5th	10th	25th	50th	75th	90th	95th
Boys									
9	2.3	0.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5
10	2.3	0.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5
11	2.3	0.1	2.1	2.1	2.2	2.2	2.3	2.4	2. 5
12	2.3	0.1	2.1	2.1	2.2	2.3	2.3	2.4	2.5
13	2.2	0.1	2.1	2.1	2.2	2.2	2.3	2.4	2.5
14	2.2	0.1	2.1	2.1	2.2	2.2	2.3	2.4	2.5
15	2.2	0.1	2.1	2.1	2.2	2.2	2.3	2.4	2.5
16	2.3	0.1	2.1	2.1	2.2	2.3	2.3	2. 5	2.5
17	2.3	0.1	2.1	2.1	2.2	2.3	2.4	2.5	2.5
Girls									
9	2.3	0.1	2.1	2.2	2.2	2.3	2.4	2.4	2.4
10	2.3	0.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5
11	2.3	0.1	2.1	2.1	2.2	2.3	2.3	2.4	2.5
12	2.3	0.1	2.1	2.2	2.2	2.3	2.4	2.4	2.5
13	2.3	0.1	2.1	2.2	2.2	2.3	2.4	2.4	2.6
14	2.3	0.1	2.2	2.2	2.2	2.3	2.4	2.5	2.5
15	2.3	0.1	2.2	2.2	2.3	2.3	2.4	2.5	2.6
16	2.3	0.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5
17	2.3	0.1	2.2	2.2	2.3	2.3	2.4	2.4	2.5

Discussion

Children of public schools, showed greater mean values of height, weight , arm girth and body surface area as compared to the corresponding measurements of boys and girls of central schools and government schools. These observations are as expected because children of public schools come from elite families and belong to high socio-economic group who get better diet and nutrition and enjoy optimum living conditions and thus show better height, weight, arm girth and hence body surface area measurements.

On comparing the height and weight measurements of boys and girls of public schools of present study with those of NCHS standards (vide Hamill et al. 1979) of US boys and girls, the boys as well as girls of even public schools of present study showed lower values of height as well as weight at all ages from 9 -17 years than their US coevals. Children of public schools of present study belong to well off families who get good diet and nutrition and enjoy optimum living conditions. Despite all these favourable circumstances they have lower values of height as well as weight than those of their US coevals. It is evident from these findings that ethnic / racial / genetic factors are also important and thus there is always a necessity of having local / regional standards of height and weight measurements.

Puberty signs. Puberty signs appeared earlier in boys as well as girls of public schools than in their coevals of central schools or government schools (Table 2). These results substantiate the observations of Indian Council of Medical Research (1972) that boys as well as girls of high socio-economic status show the puberty signs earlier and mature earlier than their less privileged coevals of lower socio-economic status.

Body Mass Index (BMI). Mean values of BMI in all the age groups of boys as well as girls of public schools were greater than those of their coevals of central schools and government schools and this could be due to better diet and better socio-economic status of boys and girls of public schools than those of their coevals of central schools and government schools.

Sex difference was also observed in this index. Almost in all the age groups girls tend to have greater mean values of BMI than those of the boys of the corresponding age groups. This observation on sex difference in BMI supports the earlier observations of Singh (1992) on adults wherin the values reported of BMI of Delhi women were greater than those of Delhi men.

Nutrition Foundation of India (1989) reported mean values and SD of BMI of 9 -18 years old affluent girls of Delhi. On comparison, it was interesting to note that in all the age groups the mean values of BMI of girls of public schools of present study were similar to those of the affluent girls of Delhi reported by the Nutrition Foundation of India (1989).

Hammer et al (1991) reported the centiles of BMI of US boys and girls of 1 to 19 years. In that study boys showed greater values of BMI than those of girls of the corresponding age groups. But in the present study, the 50th centile values of BMI of girls were greater than those of the boys of the corresponding age groups.

50th centile values of BMI of boys as well as girls of public schools of present study were lower than those of their US coevals of the corresponding age groups reported by Hammer et al (1991). These observations indicate the necessity of constructing local / regional standards of anthropometric measurements and indices.

$\sqrt[3]{weight}$/Height Index. It was interesting to note that the mean values of this index were identical in all the 9 age groups from 9 -17 years. Singh (1991) reported that mean values of this index of college girls were also identical in all the 4 age groups from 17 - 20 years. Hence $\sqrt[3]{\text{weight}}$/ height could be considered as age independent anthropometric index. (at least during the age of 9 - 20 years).

It was interesting to note that the mean values of age independent anthropometric index tended to be somewhat greater in children of public schools than in their coevals of central schools or government schools. This finding is important and this could make this index as an age independent nutrition index. This index, therefore, could be of great significance and practical importance in nutrition studies in under developed or developing countries where knowledge of the correct age of children is usually a great problem and where height and weight of particular children cannot be compared with established standards of these measurements of children of partienlar age groups.

The values of a particular centile of $\sqrt[3]{\text{weight}}$/ height of children of different age groups were identical (Table 4). Therefore, boys and girls having the value of this index below the 5th centile (2.1) could be considered under weight and those having the value more than 95th centile (2.5) could be considered over weight or obese. Further work on this index could be interesting

Acknowledgements: This study was supported by the Indian Council of Medical Research, New Delhi. Thanks are due to Ms. Prabha Malik and Ms. Gargi Roy for collection of data. The author takes pleasure in thanking Dr. N. C. Khandekar of computer centre, University of Delhi for helpful discussion and Mr. Lakshman Das also of computer centre for running the programme.

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Anthrop. Közl. *38;* 119-124. (1996/97)

COMPARISON OF AUXOMETRIC TRAITS OF UGANDAN CHILDREN WITH THE INTERNATIONAL REFERENCE (NCHS)

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Abstract: *In the malnourished populations of the Third World, most children suffer from a growth damage which leads to low weight and short stature: so, the application of Western norms results in the overestimation of the number of the children at high risk of dying of starvation, and to the improper use of the limited resources available for nutritional intervention. In this note we compare growth norms of height, weight and MUAC (mid-upper-arm circumference) for Ugandan children up to 5 years, with NCHS (1976) and Voorvoheve (1990) standards. Between April and May 1988, a survey was carried out in the district of Mbarara in the Southwest of Uganda and a total of 4320 children aged 60 months or less were included in a cluster sample. The reference set was made up of the 3654 children (1858 girls,1796 boys) known to be still alive after 1 year from the study. Results confirm that among the growth indicators taken into account, only weight for height ratio appeared to be roughly similar in Ugandan and NCHS children. The use of the 3rd percentile of international reference for height, weight and MUAC as a threshold would lead to include from 25 to 50% of Ugandan children into the class of subjects at risk of starvation. These percentages appear to be too high, if we consider that Ugandan norms are based on children who were still alive 1 year after the study.*

Key words: *Height; Weight; MUAC; Ugandan and NCHS children.*

Introduction

Lack of local references forces public health workers to resort to the NCHS (National. Center for Health Statistics) standards or other Western norms to assess the nutritional status of children in different developing countries. This practice rests upon the assumption that, before the onset of puberty, growth is similar for groups of different ethnicity which share the same favourable environment. Nonetheless, in the malnourished populations of the Third World, most children suffer from a growth damage which leads to low weight and short stature. Thus, the application of Western norms results in the overestimation of the number of the children at high risk of dying of starvation, and to the improper use of the limited resources available for nutritional intervention. Also for this reason, the International Union of Nutritional Sciences committee recommended, since 1971, the use of local standards (IUNS 1971).

In this note we compare growth norms of height, weight and MUAC (mid-upper-arm circumference) for Ugandan children up to 5 years, with NCHS (1976) and Voorvoheve (1990) standards.

Subjects and Methods

Between April and May 1988, a survey was carried out in the district of Mbarara in the South-West of Uganda. Mbarara is a hilly district (about 957,000 inhabitants in 1989), the town of Mbarara is mainly an administrative and trading centre (Cortinovis, Vella and

Ndiku. 1993). Crop production consists mainly of bananas, sorghum, potatoes, beans, groundnuts, some of which are cultivated as cash-crop. A total of 4320 children aged 60 months or less were included in a cluster sample. From all the villages in the district (about 1300), 31 villages were randomly selected with probability proportional to the size. In each village selected, all families with at least one child under 5 years were taken into account. As to ethnicity, 80% of the children in the reference set were Banyancole, 11% Bakiga, 5% Baganda, and the remaining 4% belonged to other ethnic groups, such as Rwandan refugees.

Since standards are intended to the detection of high risk children, and because of the high rate of child mortality in Uganda, survival was chosen as a criterion of good health condition. Therefore the reference set was made up of the 3 654 children (1858 girls, 1796. boys) known to be still alive after 1 year from the study.

Length of babies under 24 months, or height of children over 24 months, was measured with a length board built according to the guidelines of *the National Household Surve. Capability Programme* (1986). Weight was recorded to the nearest 100 g with a spring scale, the accuracy of which was checked daily. MUAC was measured to the nearest millimetre with. an insertion tape provided by UNICEF. Measures were taken by a team of 20 assessors *ad hoc* trained. As to age, children of either sex were rather uniformly distributed between 1 and 60 months. In nearly all cases, each 1-month-wide age class included 20 to 50 subjects. To estimate children's age a local calendar was drawn up with the help of the village chief. When available, birth and vaccination certificates were also used.

Raw non-parametric estimates of percentiles (3rd, 10th, 25th, 50th, 75th, 90th, 97th) were obtained in each age class. Raw estimates were *smoothed by weighted linear models* (Healy, Rasbash and Min Yang 1988) including sex, age, percentile's normit, powers and logarithm of age, powers of normit, and selected interactions. The *weight* was proportional to the reciprocal of the variance of the raw estimates, which is higher for extreme percentiles and in age classes with a lower number of children.

Results

A severe growth delay is apparent in Ugandan girls and boys. On the average, Ugandan children attain 100 cm height at the age of 4 year and 9 months, whereas NCHS children attain that height 1 year earlier. Furthermore, Ugandan children reach 15 kg weight at the age of 4 years and 4 months, whereas NCHS children reach that weight 1 year earlier.

Figure 1 shows percentiles of height and weight of Ugandan girls and boys as a function of age. Percentiles are expressed as standard deviation scores based on the means and standard. deviations (conditional on age) of NCHS reference. Both height and weight of Ugandan children decrease with increasing age with respect to NCHS reference. Mean height is -1 SDS. below the mean height of NCHS children at 6 months and about -2 SDS at 5 years: so half of Ugandan children 5 years old are below the 3rd percentile of NHCS norms. In Ugandan norms the difference between the 97th and the 3rd percentile is 1.5 times wider than in NCHS norms, likely because of heterogeneity of the sample as regards ethnicity and nutritional status.

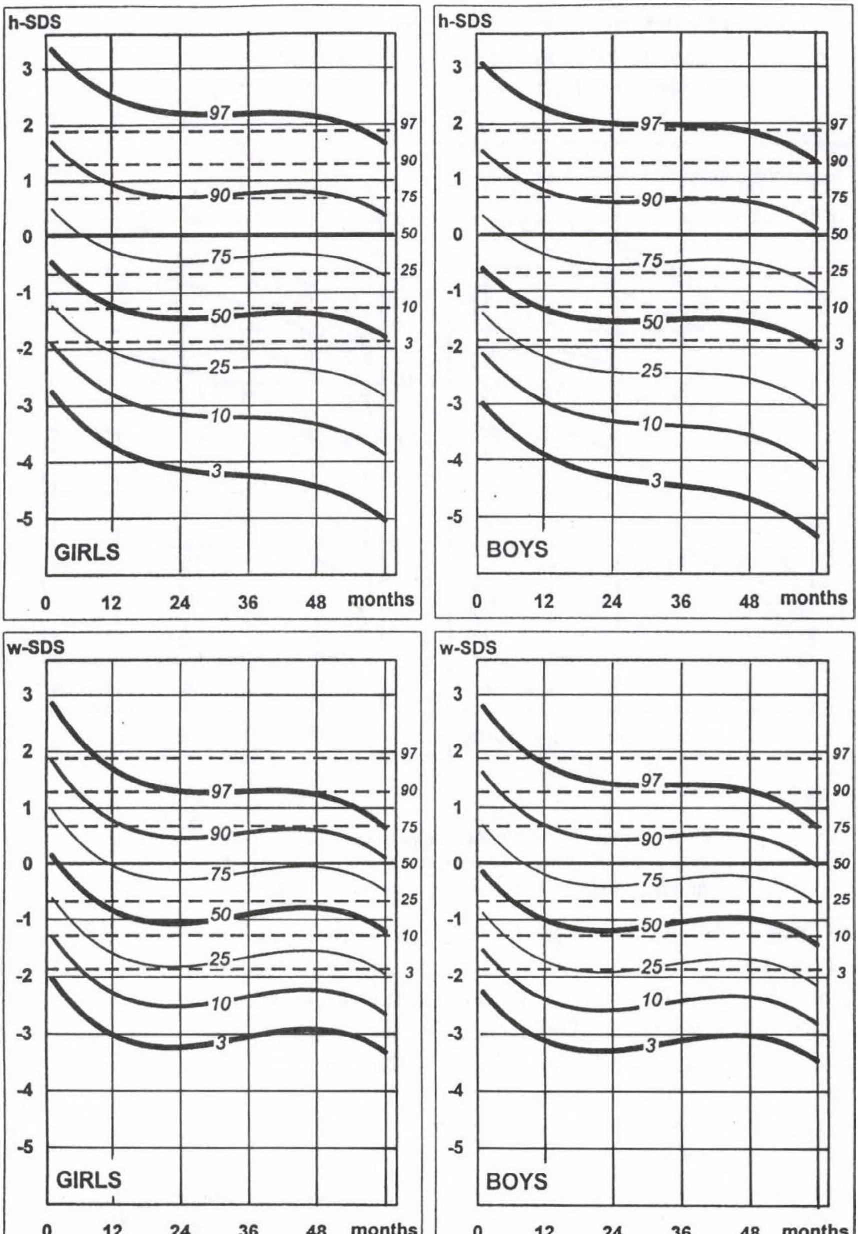

Fig. 1: Percentiles of height (top) and weight (bottom) as a function of age in Ugandan girls

The curves (solid lines) represent the percentiles of Ugandan norms expressed as standard deviation scores (h-SDS and w-SDS) based upon the means and standard deviations (conditional on age) of NCHS reference. Dashed horizontal lines represent the percentiles of NCHS reference.

Mean weight of Ugandan children is -0.5 SDS below the median height of NCHS at the age of 6 months and about -1.3 SDS at 5 years: 25 to 30% of Ugandan children 5 years old are below the 3rd percentile of NHCS norms.

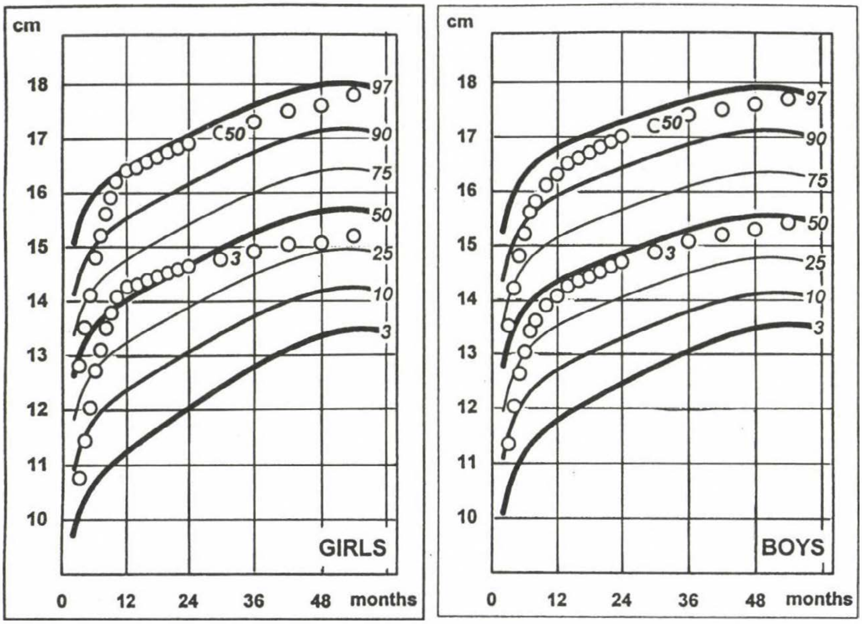

Fig. 2: Percentiles of MUAC (solid lines) as a function of age in Ugandan girls (left) and boys (right).Open circles represent the 5th and the 50th percentile of Dutch norms (Voorhoeve 1990)

Figure 2 shows MUAC norms for Ugandan girls and boys up to 5 years of age together with the 5th and the 50th percentile of Dutch norms (Voorhoeve 1990). In the first 4 months of life MUAC values are very similar in the two growth norms. After the age of 9 months, the 50th percentile for Dutch children roughly corresponds to the 97th percentile for Ugandan children. The 3rd percentile of Dutch children corresponds to the 50th percentile of Ugandan children between 9 and 24 months, and tends to the 25th percentile subsequently: so, 50 to 30% of Ugandan children aged 9 to 60 months are below the 3rd percentile of the international reference.

Figure 3 shows percentiles of weight for height as a function of age in Ugandan girls and. boys. The values of the ratio of weight to height is similar in Ugandan and NCHS children, as regards the percentiles from the 10th to the 75th. The 3rd percentile of Ugandan children is consistently below the 3rd percentile of NCHS reference. The 90th and 97th percentiles tend to be higher in Ugandan children, mainly in the first 2 years of life.

The curves (solid lines) represent the percentiles of Ugandan norms expressed as standard deviation scores (w-h-SDS) based upon the means and standard deviations (conditional on age) of NCHS reference. Dashed horizontal lines represent the percentiles of NCHS reference.

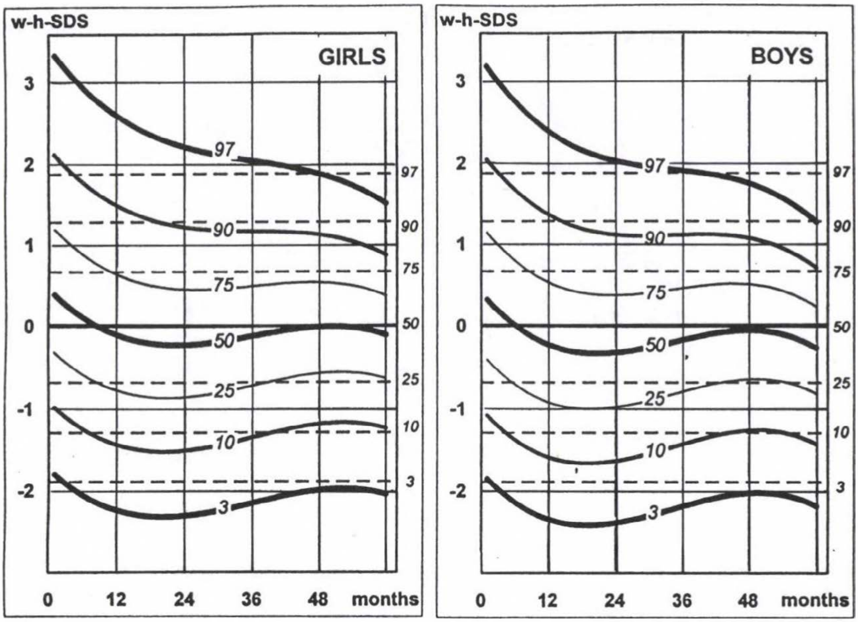

Fig. 3: Percentiles of weight for height as a function of age
in Ugandan girls (left) and boys (right)

Comments

Results here outlined confirm that there are large differences in height and weight growth between children living in Western Countries and children who survive in the Third World. These differences tend to increase with increasing age, as a result of the cumulate effects of undernutrition and prolonged exposure to diseases.

Among the growth indicators taken into account, only weight for height ratio appeared to be roughly similar in Ugandan and NCHS children. The use of the 3rd percentile of NCHS norms for height and weight, and of Voorvoheve's norms for MUAC, as a threshold would lead to include from 25 to 50% of Ugandan children into the class of subjects at risk of starvation. These percentages appear to be too high, if we consider that Ugandan norms are based on children who were still alive 1 year after the study. On the contrary, local growth standards are expected to have higher predictive value in identifying the true high-risk children: this is of paramount importance in emergency situations when the selection of priorities and the lives of many children depend upon the effectiveness of mass screening.

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Anthrop. Közl. *38*; 125-129. (1996/97)

PHYSICAL GROWTH AND DEVELOPMENT OF CHILDREN OF PUNJAB

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Abstract: *The study aims at evaluating the growth performance of primary school children of Patiala (Punjab, India) belonging to lower and lower-middle socio-economic groups, with special emphasis on the effects of social class and urbanization. Cross-sectional data on 1380 children (656 boys and 724 girls) ranging in age from 6 to 12 years were collected during 1974. Dimensions measured were height, weight, circumference of chest and upper arm, triceps, subscapular and suprailiac skinfolds. Standard techniques (Weiner and Lourie 1969) were followed for taking these measurements. The boys are significantly taller and heavier than the girls, whereas the girls possess significantly more amounts of subcutaneous tissue, from 6 to 12 years. The Punjabi children are taller than the combined Indian sample. On average, the children of the present study are smaller in size and lighter in body weight than British children and fall between the 3rd and 25th centiles of the British standards. Children belonging to lower and lower-middle socio-economic classes are significantly lighter in body weight and smaller in height than their coevals of higher groups. The urban boys are taller and heavier than their rural peers, however, the differences are not as marked and clear as those of socio-economic groups.*

Key words: *Growth and development; Punjab/India.*

Introduction

There is a great socio-economic diversity in India which probably affects the growth performance of children belonging to different groups. Comprehensive studies on the growth of children with respect to social class and urbanization are few in this part of the country (Sharma and Kaul 1970, Sidhu and Phull 1974, Garg 1978, Hauspie, Das, Preece and Tanner 1980). The present study is aimed at evaluating the growth performance of primary school children belonging to lower and lower-middle socio-economic groups of Patiala city with special emphasis on the effects of social class and urbanization.

People generally follow a vegetarian diet and usually consume cereals, pulses and vegetables. The consumption of milk, milk products, fruits and meat products if fairly low, Keeping in mind the economic stresses; under which these groups live, it is reasonable to assume that their nutrient intakes may be inadequate. The parents of these children are mainly daily wage earners, unskilled workers (lower socio-economic class), skilled workers, civil servants, petty shopkeepers, small trades (lower-middle socio-economic class), and so on.

Material and Methods

The present cross-sectional study was conducted on 1380 children (656 boys and 724 girls), aged 6-12 years, from Patiala city in the Punjab State of India, during 1974. The delay in reporting this data has unfortunately been due to the lack of computation facilities. Eight out of a total of about two dozen Government schools, distributed in different colonies of Patiala city, were chosen for data collection so that each area should be duly represented.

Table 1: Body weight, height, chest circumference and upper arm circumference in Punjabi boys and girls, aged 6-12 years

Age group (yr)	N		Height		Body Weight		Chest Circ.		Upper arm circ.	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
6±	60	52	112.30	102.50	17.25	16.21	54.80	50.90	14.61	14.52
			(7.22)	(8.14)	(3.12)	(2.17)	(2.21)	(2.39)	(0.95)	(0.98)
7±	87	133	118.50	110.10	19.57	17.51	56.20	52.20	15.92	14.86
			(6.19)	(5.98)	(2.82)	(2.04)	(1.87)	(2.25)	(1.27)	(0.93)
8±	109	123	124.10	115.90	21.62	19.15	57.90	53.50	16.34	15.25
			(7.26)	(6.97)	(3.27)	(3.05)	(1.92)	(2.76)	(1.09)	(1.15)
9±	123	163	129.70	121.00	24.08	21.05	59.10	54.90	16.52	15.68
			(6.37)	(6.97)	(3.13)	(2.65)	(2.83)	(2.76)	(0.92)	(1.16)
10±	126	167	132.60	125.80	35.66	23.02	61.80	56.00	17.32	16.16
			(5.85)	(6.20)	(2.95)	(3.31)	(1.76)	(2.95)	(0.96)	(1.17)
11±	84	45	136.20	128.70	27.71	24.51	63.40	57.20	17.70	16.27
			(6.41)	(6.62)	(3.89)	(4.82)	(2.09)	(3.52)	(1.21)	(1.43)
12±	67	41	140.90	133.30	29.29	26.90	65.60	59.10	18.08	16.90
			(6.68)	(6.90)	(3.75)	(4.58)	(2.37)	(3.69)	(1.17)	(1.55)

All apparently healthy, normal and; unrelated children of these selected schools were measured for weight, stature, upper arm and chest circumferences, subscapular, suprailiac and triceps skinfolds. The techniques as recommended by the IBP/HA Growth Sub-committee (Weiner and Lourie 1969) were followed for taking these measurements.

Dates of birth of the children were noted from the school registers, maintaining fairly accurate records, and decimal ages on examination were calculated to three places. Age grouping was done in the following manner: group 6 ± included all children between 5.500 and 6.499 years, group 7 ± included children between 6.500 and 7.499 years, and so on. The distribution of children in each age-group is given in Table 1.

Results

The mean and SD of various body measurements in Punjabi boys and girls, aged 6-12 years have been presented in Tables 1, 2. The boys are significantly taller and heavier and possess larger chest and upper arm girths than the girls who, on the other hand, have more amounts of subcutaneous tissue.

Table 2: Triceps, subscapular and suprailiac skinfolds in Punjabi boys and girls, aged 6-12 years

Age group (yr)	Triceps		Subscapular		Suprailiac	
	Boys	Girls	Boys	Girls	Boys	Girls
6±	7.15 (1.82)	8.12 (2.69)	5.08 (1.21)	5.17 (1.16)	3.85 (0.88)	4.02 (1.07)
7±	7.02 (2.23)	8.03 (1.95)	4.83 (0.92)	5.14 (1.12)	3.79 (0.97)	4.17 (1.07)
8±	6.98 (2.19)	7.95 (1.95)	4.95 (0.76)	5.27 (1.26)	3.94 (1.28)	4.59 (1.69)
9±	6.67 (1.68)	7.77 (2.47)	5.13 (0.83)	5.35 (1.34)	4.66 (1.18)	4.82 (1.96)
10±	6.80 (1.73)	8.20 (1.77)	5.22 (0.97)	5.55 (1.50)	4.07 (1.31)	5.07 (1.59)
11±	6.91 (1.91)	8.13 (2.04)	5.09 (0.83)	5.69 (1.93)	4.58 (1.06)	5.36 (2.08)
12±	7.09 (1.85)	8.34 (2.05)	5.36 (1.27)	6.05 (1.55)	4.71 (1.57)	5.48 (2.38)

The children of the present study have been compared with the combined Indian sample (ICMR 1972) for height and weight and Bengali middle class children (Hauspie et al. 1980) for height. The Patiala boys are taller than the combined Indian sample as well as the middle class Bengali boys. The Patiala boys may be genetically larger than the Bengali boys because the environmental factors affecting the Bengali boys are more favourable than those affecting the Patiala boys. The combined Indian sample is a pool of many ethnic and socio-economic groups. However, the heights of the girls from all these groups are practically similar. The body weight of Patiala children is greater compared to their combined Indian counterparts.

Comparisons of Punjabi children with the British standards were also made with the objective of evaluating the growth status of children in the present study with a population from a developed country. For height and weight, standards of Tanner, Whitehouse and Takaishi (1966) and for triceps skinfold, standards of Tanner and Whitehouse (1975) were chosen for comparisons. The height of the average Punjabi boys is between the 10th and 25th centiles and that of the average Punjabi girls is around the 3rd centile of the respective British standards. The weight and triceps standards in British children are based on the log transformations, whereas in the present study these variables were not log normalized. Had the log transformation of weight and skinfolds been attempted in the present study, the mean values would have come down slightly and the position of Punjabi children vis-a-vis British standards, which is now between the 10th and 25th centiles, would rightly have been towards the 10th centile or thereabouts.

Discussion

Children belonging to Group II (lower socio-economic) of the present study are significantly lighter in body weight and smaller in stature than their coevals belonging to Group I (higher socio-economic) throughout the period of study. Similar findings have been reported on many population groups in India (Sharma and Kaul 1970, Banik et al. 1972, ICMR 1972, Garg 1978). The socio-economic differences in height and weight, especially in girls, became magnified around 11-12 years, because around these ages the higher social class girls may be experiencing their adolescent spurts in height whereas their lower social class coevals may quite behind them in adolescent development. Tanner (1978) has similarly observed that the upper socio-economic groups are larger and have a more rapid tempo of growth. The socio-economic differences leading to better growth performance of higher social status children are almost universal and have been found in developing and developed countries (King, Faucauld, Faugere and Severinghaus 1963, Eveleth and Tanner 1976). Only one study on contemporary Swedish children has so far not shown any differences in growth performance of children belonging to different socio-economic classes (Lindgren 1976).

There are all shades of socio-economic groups in India, from highly underprivileged slum-dwellers to the elite industrialists. The two groups studied to not illustrate the extremes, therefore the magnitude of the differences between the socio-economic levels is just moderate. The people belonging to the higher socio-economic group can afford better living accommodation, good nutrition and have greater access to health care delivery services than their less privileged counterparts. Marriages within the lower social group usually take place between people living near to each other, due to financial constraints restricting mobility, whereas the "upper" group people are able to choose their spouses from more distant places as they travel more, thus leading to greater genetic variability. It may be speculated from above that hybridization may in part contribute to the socio-economic differences in the growth performance of children, however, this needs data to support it. The differences in the growth of the two categories of children recorded here would mainly, and not entirely, emanate from the differences in the socio-economic levels of the two groups. It seems probable, as Eveleth and Tanner (1976) have generalized, that all such differences might not be of social class origin since the classes are to some extent endogamous and movement from one class to another in some cultures is linked with size and ability.

The children of the urban areas of lower and lower-middle classes have undoubtedly greater access to these facilities than their rural counterparts, but these are well below the level enjoyed by the upper classes. There seems to be some qualitative difference in the urban and rural environments in this area. The socio-economic levels of the urban and rural samples are nearly similar, both groups belong to the lower and lower-middle class of society. Thus the differences in the urban rural comparisons reflected here, and which are not as marked and clear as those of socio-economic comparisons would largely be due to the effect of urbanization.

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Anthrop. Közl. 38; 131-135. (1996/97)

STABILIZATION AGE OF BODY MEASUREMENTS IN A NORTH EASTERN HUNGARIAN SAMPLE (BESZTEREC)

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Abstract: *In order to determine the stabilization ages of ten body measurements, a sample including 151 males between three and eighty-one years of age and 216 females between three and ninety-one years of age was examined by the authors. Sampling compared with the total number of inhabitants was thirty-one per cent for males and forty-one per cent for females with a representation of boys and girls below the age of nineteen, of forty-seven per cent and forty-one per cent, respectively. Stabilization ages were determined by Gauss-method. In this sample certain measurements showed an earlier (between thirteen and fifteen years of age) stabilization than it was expected, while other measurements referred to a later stabilization (between twenty-seven and twenty-eight years of age). Although differences between stabilization ages according to the sex were found, an unexpected coincidence could be pointed out for body height.*

Keywords: *Body dimensions, Maturation*

Introduction

Our study deals with the stabilization of body measurements. In physical anthropology an individual is usually considered to be an adult over eighteen years of age.

The aim of our present study is to contribute further data to the debate whether this age limit can be supported in the case of the examination of body measurements. We want to determine the age over which the special body measurements become and remain stable despite the possible ontogenetic changes. In this way, we want to be as precise as possible. We presuppose that we should alter the lower limit of the adult age group.

Materials and Methods

The researchers of Kossuth University of Debrecen have been investigating small populations living in the area of Rétköz since the nineteen-seventies. Rétköz is situated in North-Eastern Hungary, bordered by the River Tisza from the north, and by the Lónyai Canal from the south (Figure 1).

Until the end of the last century it was rather a swampy area and the present villages were islands. The populations could usually contact by boat, even in summer. This geographical isolation affected the marriage system and resulted in endogamous populations. The drainage of the Rétköz ended in the nineteen-fifties and the break-up of this isolation is to be observed (Borsy 1961, Marosi and Szilárd 1969, Pók 1992).

The center of the project is the village of Beszterec. It has a rather small population; the composition of the population is shown in Table 1.

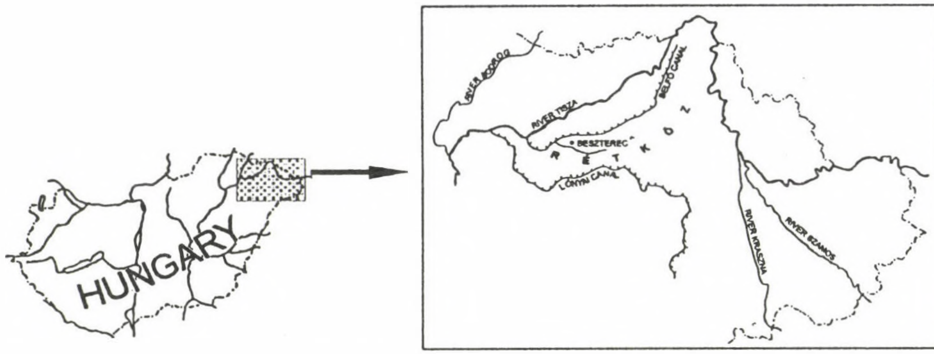

Fig. 1: The area of Rétköz in Hungary

Table 1: Sample examined

Years	Total number of inhabitants (Census 1990)			Sample					
	Males	Females	Together	Males		Females		Together	
				N	%	N	%	N	%
0-14	128	141	269	64	50	72	51	136	51
15-23	69	71	140	13	19	23	32	36	28
24-x	297	353	650	74	25	121	34	195	30
Together	**494**	**565**	**1059**	**151**	**31**	**216**	**38**	**367**	**35**

A cross-sectional sampling was carried out in 1992-93. The body measurements of altogether 151 males and 216 females were recorded.

Table 2 shows the body measurements we selected. Height measurements go from one to five, width measurements go from six to ten.

Table 2: Examined body measurements (Martin 1928)

Body measurements
Body height
Sitting height
Shoulder height
Finger height
Iliac spine height
Shoulder width
Chest breadth
Chest depth
Chest circumference
Hip width

In the first step for the determination of the age of stabilization we charted the distribution of the data of each body measurement (Figure 2). This set of points was approximated by a six-order polynomial curve (Faux and Pratt 1979; Figure 3).

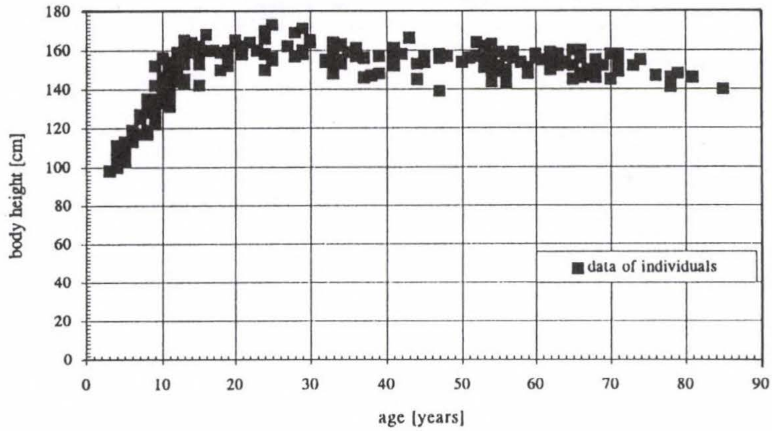

Fig. 2: Distribution of data (Body height, females)

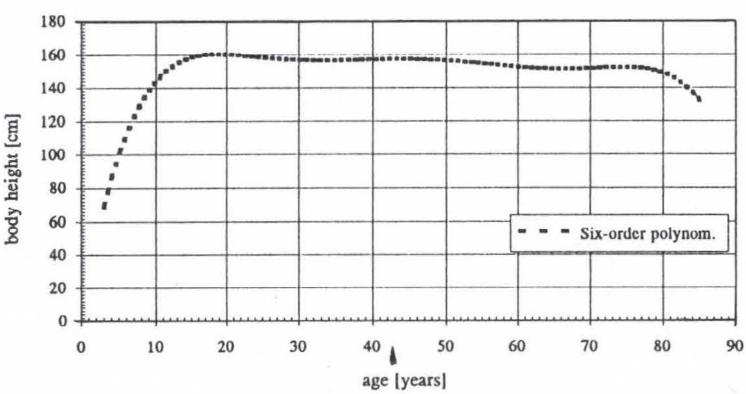

Fig. 3: The six-order polynomial curve (Body height, females)

In the second phase of the accurate calculation of the age of stabilization the Gauss method was used. We divided the set of ages into two parts and for both parts a regression line (a first approximation line) and the correlation of the lines were calculated as follows:

$$\eta = \sqrt{1 - \frac{S^2}{S_x S_y}}$$, where s, s_x, s_y are variances of *[y- (ax+b), x, y]*

The maximum sum of the two correlations and this division age were considered to be the accurate age of stabilization (Figure 4).

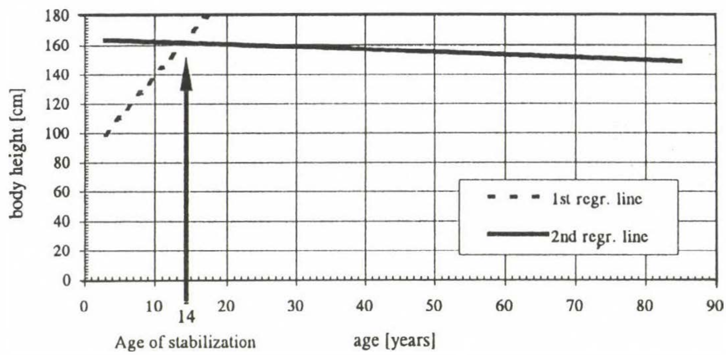

Fig. 4: The best-connecting regression lines (Body height, females)

Results and Conclusions

The results are shown in the Table 3.

Table 3: Stabilization age of body measurements (Beszterec, Hungary)

Body measurements	Age of stabilization (years)	
	Females	Males
Body height	14	14
Sitting height	16	17
Shoulder height	16	14
Finger height	16	17
Iliac spine height	14	18
Shoulder width	13	19
Chest breadth	28	15
Chest depth	14	18
Chest circumference	22	20
Hip width	15	27

Surprisingly, an early stabilization of the body height can be pointed out in both sexes. There are some measurements, namely, the hip width, the chest breadth and the shoulder width, the stabilization age of which refers to a significant sexual difference.

The development of the hand, which we examined by using the same method, does not show so significant differences as denoted above (Almási and Szathmáry 1994). The age of stabilization varies between 14 and 18 years (males) and between 13 and 16 years (females). The length of hand stabilizes in the same year of age (16 years) for both sexes. Presumably we should draw a parallel between this result and the stabilization of body height (14 years of age).

The result of our examinations demonstrated above may cast doubts on the rightness of the general use that the dividing line between the young and adult samples are drawn at the same age (18, 20 or 23 years) for all dimensions. The same doubts can be cast on the limits of senium (cf. Figure 2).

On pondering the above arguments we feel prompted to call attention to the suggestion that the stabilization age of body dimensions can be different. Therefore a comperative analysis of adult individuals or adult populations should only be performed within stabilized age-intervals.

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Anthrop. Közl. *38;* 137-144. (1996/97)

ON THE CORRELATION STRUCTURE OF BODY MEASUREMENTS IN SUBADULTS

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Abstract: *The authors carried out principal component analyses on ten body measurements of an adult and four subadult age groups to describe the tendency of changes in their correlation structure during growth. The sample consisted of altogether 151 males and 216 females examined in a village situated in NE Hungary (Beszterec). The representation of boys and girls below the age of twenty-three was thirty-nine per cent and fifty-nine per cent, respectively, as compared with the total number of inhabitants.*

According to the analysis of the correlation structure of body measurements the constitution of children between three and seven years of age were indistinct in both sexes. The correlation pattern characteristic of adults could already be pointed out between eight and ten years of age. This pattern broke up between fifteen and twenty-three years of age for males and between eleven and fourteen years of age for females.

Keywords: *Body measurements; Correlation system; Growth.*

Introduction

The present paper is about the constitution of children and its changes during growth. In the course of our examinations a multidimensional approach was applied similarly to a study on the interrelationship of various anthropometric traits of Lithuanian children (Tutkuviene 1994). The constitution is interpreted as the correlation system of body measurements and we make an attempt at describing the changes of this correlation system which manifest during maturation.

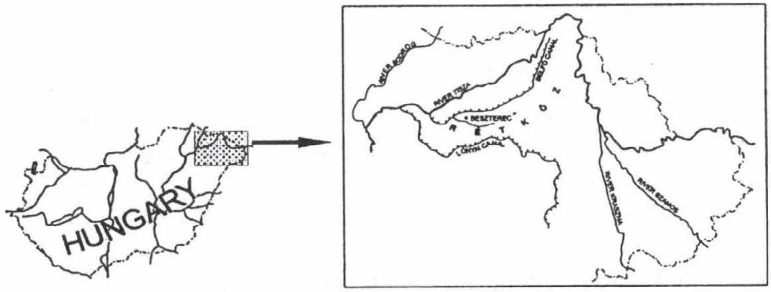

Fig. 1: Map of the region

For this purpose, the population of the village called Beszterec and situated in the area of Rétköz, NE Hungary, was investigated (Figure 1). The isolation of the villages in this swampy region was maintained until the end of the last century but has broken up recently because of the drainage of the area of Rétköz (Borsy 1961, Marosi 1990, Pók 1992). Therefore, the populations in this area of which an inbreeding was typical in the Middle Ages have become more exogamous ones, however, they still seem to have some endogamous characteristics (Hajdú and Szelci 1980).

Material and Method

In 1992-93 a cross-sectional sampling was carried out in the population of Beszterec. The body measurements of altogether 151 males and 216 females were recorded. The representation of the individuals below 14 years of age was about 50 per cent while that of the total sample was about 35 per cent as compared with the total number of inhabitants (Table 1).

Table 1: Sample examined

Years	Total number of inhabitants (Census 1990)			Sample Males		Females		Together	
	Males	Females	Together	N	%	N	%	N	%
0-14	128	141	269	64	50	72	51	136	51
15-13	69	71	140	13	19	23	32	36	28
24-x	297	353	650	74	25	121	34	195	30
Together	**494**	**565**	**1059**	**151**	**31**	**216**	**38**	**367**	**35**

Table 2 shows the age-composition of the sample examined according to the division used in this investigation (Szilvássy 1986, Szilágyi 1992).

Table 2: Age groups examined

Age groups	Males	Females	Together
Infans I. (3-7 years)	19	16	35
Infans II/a. (8-10 years)	18	23	41
Infans II/b. (11-14 years)	27	33	60
Juvenis (15-23 years)	13	23	36
Ad.-Sen. (24-x years)	74	121	195
Together	**151**	**216**	**367**

The body measurements analysed include height measurements (go from 1 to 5), and measurements which are mainly related to width (go from 6 to 10) (Table 3).

In each age group a principal component analysis on the body dimensions, using varimax rotation method, was carried out in order to describe the correlation structure which was characteristic for that group. Furthermore, the rotated factor matrices were clustered on the basis of average linkage between groups using squared Euclidean measure.

Table 3: Body measurements examined (Martin 1928)

1. Body height	6. Shoulder width
2. Sitting height	7. Chest breadth
3. Shoulder height	8. Chest depth
4. Finger height	9. Chest circumference
5. Iliac spine height	10. Hip width

Results

Seeing the dendograms it is striking that, as it was to be expected, the variables are usually grouped into two main clusters. One of the clusters is definitely related to the height measurements, which are printed in italics, the other to the rest of the measurements. It is the age group of boys aged 3 to 7 years that does not show the separation of height and other measurements, which means that the constitution of boys belonging to this age group is indistinct (Figure 2). The separation of the height dimensions from other ones can be pointed out in the second age group, just as in the third one (Figures 3 and 4). This harmonic pattern of the correlation breaks up between 15 and 23 years of age. While the sitting height obviously correlates with width measurements, the hip width is connected with the height dimensions. It is striking, that the chest depth has a definite outstanding position (Figure 5). In adults the separation of height measurements from the rest of the dimensions can be observed again (Figure 6). It is the 1st, 2nd, 6th, 7th and 8th variables, that show stable structure during growth. The pattern of correlation of body measurements breaks up between 15 and 23 years of age most of all.

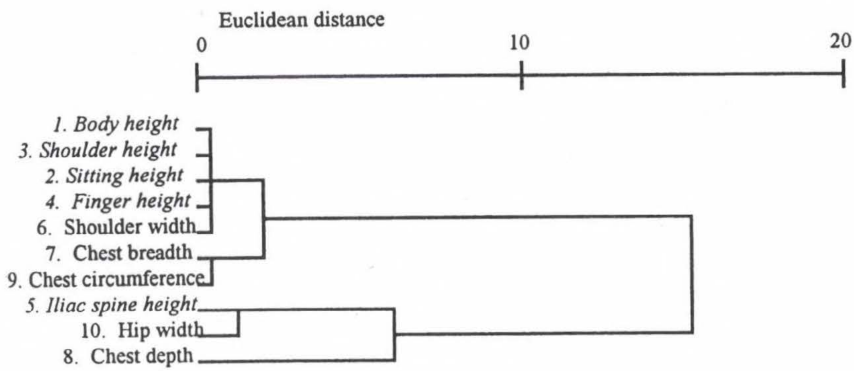

Fig. 2: Dendogram based on the cluster analysis of the factor matrix of boys between 3 and 7 years

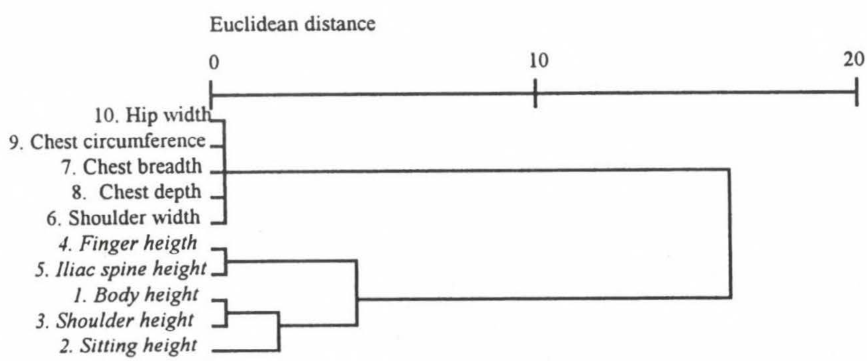

Fig. 3: Dendogram based on the cluster analysis of the factor matrix of boys between 8 and 10 years

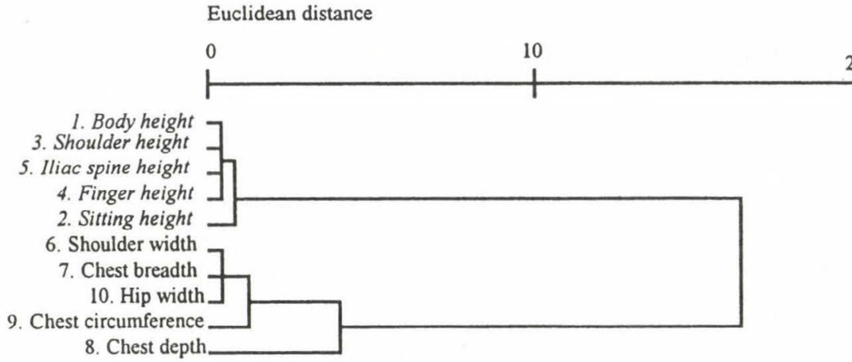

Fig. 4: Dendogram based on the cluster analysis of the factor matrix of boys between 11 and 14 years

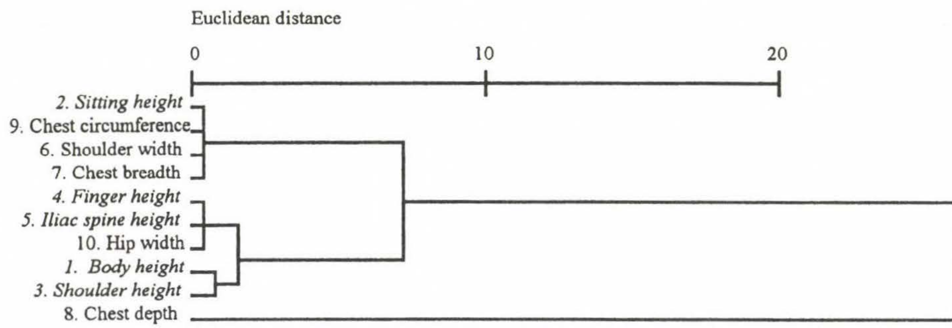

Fig. 5: Dendogram based on the cluster analysis of the factor matrix of boys between 15 and 23 years

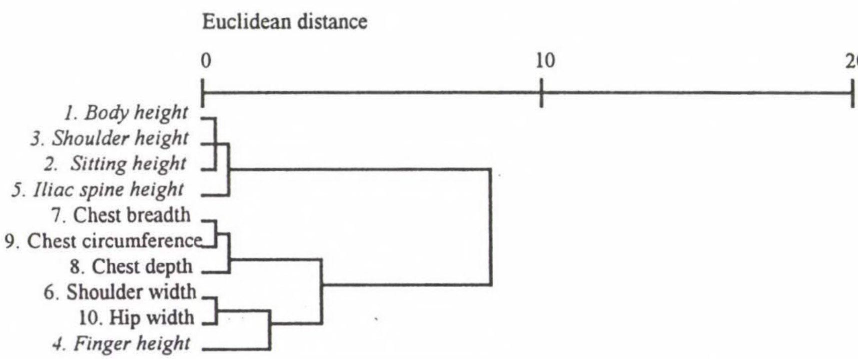

Fig. 6: Dendogram based on the cluster analysis of the factor matrix of males over 24 years

In the case of females the body dimensions are highly correlated with each other in the first age group. Consequently, in this sample the constitution of girls below 8 years of age are even less definable and indefinite than that of the boys at the same age (Figure 7). The height dimensions seem to separate from the others in the second group (Figure 8). This separation does not characterise the third age group, mainly because of the change of the correlative position of finger height (Figure 9). The separation of the dimensions can be observed between 15 and 23 years of age and also in adults, although the correlation of shoulder width differs from that of other width dimensions (Figures 10 and 11). The most significant change of the correlation pattern can be shown between 11 and 14 years of age during growth.

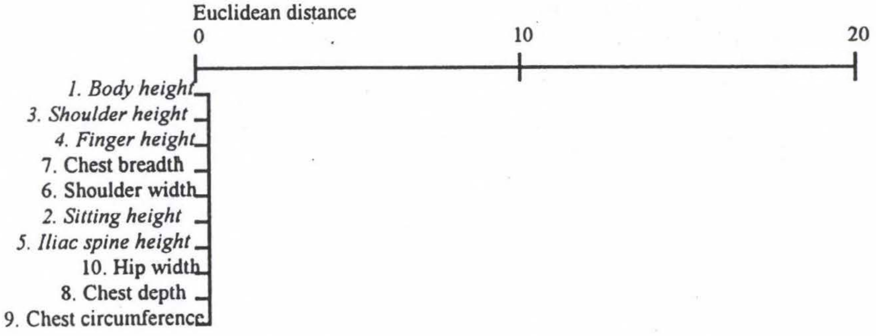

Fig. 7: Dendogram based on the cluster analysis of the factor matrix of girls between 3 and 7 years

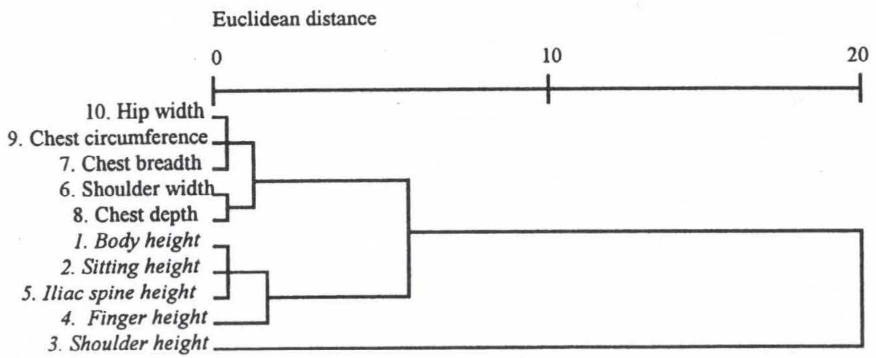

Fig. 8: Dendogram based on the cluster analysis of the factor matrix of girls between 8 and 10 years

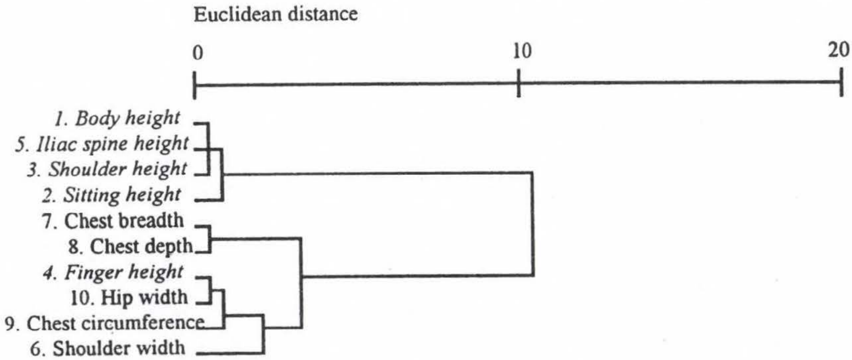

Fig. 9: Dendogram based on the cluster analysis of the factor matrix of girls between 11 and 14 years

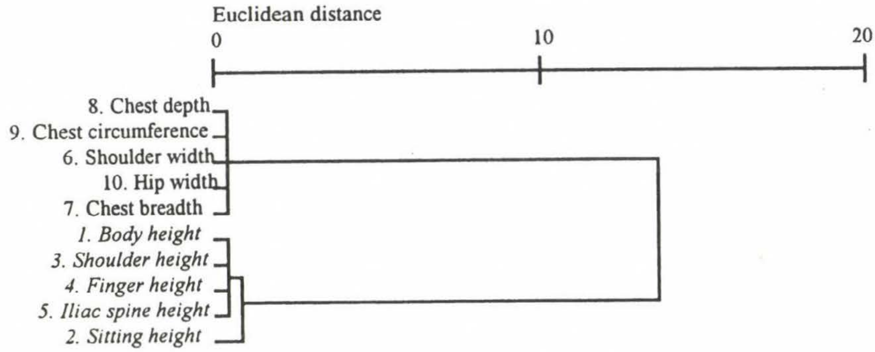

Fig. 10: Dendogram based on the cluster analysis of the factor matrix of girls between 15 and 23 years

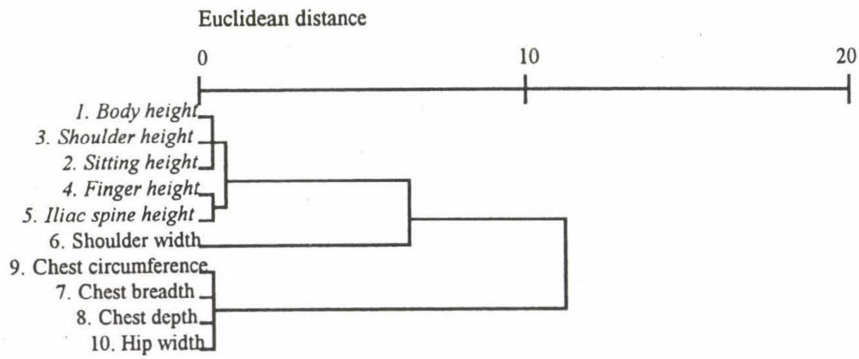

Fig. 11: Dendogram based on the cluster analysis of the factor matrix of females over 24 years

Comparing the results of the sexes, we will not take the first age groups into consideration, because they have, especially in the case of girls, rather an indefinite structure. Most of the dimensions show the same pattern in males and females. There are two dimensions in both the second and the third age group which differ in the sexes: the shoulder height and the finger height. The greatest sexual difference can be found between 15 and 23 years of age. In adults it is the shoulder width and finger height, that have different correlative positions (Table 4).

If we pick out the height measurements from the whole correlation structure, three phases of the individual development can be outlined: developmental phase; transformational phase; re-arrangement phase. The dynamics of these phases is different in the sexes.

The development of the close correlation of the five height dimensions proceeds earlier and remains stable longer in males (between 3 and 7 years of age : 1st, 3rd, 2nd, 4th+5th measurements; between 8 and 14 years of age : all five measurements). An intensive transformational phase follows that between 15 and 23 years of age (2nd+4th, 5th+1st, 3rd measurements). The tendency of re-arrangement is definite over the 24 years of age (1st, 3rd, 2nd, 5th+4th measurements).

The correlation of the five height dimensions cannot be observed below 7 years of age in females, but it is developed between 8 and 10 years of age completely. The transformational phase following that between 11 and 14 years of age is moderate (1st, 5th, 3rd, 2nd+4th measurements). The re-arrangement phase starts at as early as 15 years of age. From that time on the correlation of the five height measurements concerned are the same as between 8 and 10 years of age.

The arguments mentioned above call our attention to the fact, that it is the height measurements that likely have a discriminative importance in the course of the development of constitution.

Table 4: Comparison of correlation pattern of sexes
(Similarities mean the measurements have similar position in the correlation pattern in both sexes. Dissimilarities refer to the different correlation of measurements.)

Age groups	**Similarities**		**Dissimilarities**
	Height measurements	**Other measurements**	
8-10 years	1. Body height 2. Sitting height 4. Finger height 5. Iliac spine height	6. Shoulder width 7. Chest breadth 8. Chest depth 9. Chest circ. 10. Hip width	3. Shoulder height
11-14 years	1. Body height 2. Sitting height 3. Shoulder height 5. Iliac spine height	6. Shoulder width 7. Chest breadth 8. Chest depth 9. Chest circ. 10. Hip width	4. Finger height
15-23 years	1. Body height 3. Shoulder height 4. Finger height 5. Iliac spine height	6. Shoulder width 7. Chest breadth 9. Chest circ.	2. Sitting height 8. Chest depth 10. Hip width
24-x years	1. Body height 2. Sitting height 3. Shoulder height 5. Iliac spine height	7. Chest breadth 8. Chest depth 9. Chest circ. 10. Hip width	4. Finger height 6. Shoulder width

Conclusions

According to the analysis of the correlation structure of body measurements the constitution of children between 3 and 7 years of age are indistinct in this sample. The correlation pattern characteristic of adults, that is, the separation of height measurements from the ones related to width can already be pointed out between 8 and 10 years of age. This pattern breaks up between 15 and 23 years of age for males and between 11 and 14 years of age for females.

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Anthrop. Közl. *38;* 145-148. (1996/97)

OBSERVATION OF SEX RATIO AFTER AID

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Abstract: *207 newborn babies (151 boys and 157 girls) concepted by artificial insemination of donors (AID) have been studied.*

The inseminations were performed in the Schöpf Merey's Hospital and Maternity Care Centre Budapest between 1980 and 1995.

We found that if the day of insemination was between 12th and 14th day after the first day of cycle, the sex ratio (girls:boy) was 1:0.77 Before or after these days it was 1:1.54.

The difference between the boys' and girls' gestational days (x=262.9 SD=9.53 versus x=266.9 SD=7.05) was significant.

Key words: *Sex ratio; Artificial insemination.*

Introduction

The first observations on the connection of sex ratio and the conceptional day in human were published by Guerrero (1974) than Harlap (1979). They have find that more girls born if the insemination were performed in middle of the fertility period. Before and after this days, the ratio of the boys are higher.

Later on Vermel and Ozoga (1981) among the deers, Paul and Kuester among the macaca-monkeys and Handricks and McKlintock (1990) among the rats published similar findings: there is a strong connection between the conceptional day and sex of the offsprings.

James (1994) found that there is an U-shape regression between the sex ratio at birth and the day of insemination. Similar results were found if the calculation were performed between the sex ratio at birth and the gestational days.

Material and method

310 newborn babies concepted by artificial insemination of donors (AID) have been studied. This is selected material from the more than one thousand artificial insemination which were performed by prof. Horváth in the Shöpf Merey's Hospital and Maternity Care Centre, between 1980 and 1995. From this study were excluded

- the twin pregnancies
- delivery before 28th week
- cesarean sections, and
- EPH gestosis or any kind of problem of pregnancy

The next data were collected in each cases:

1. the number of the day of insemination in the cycle
2. the sex of the newborn baby

3. length of the gestational period
4. and the noted body measurements like birth weight, recumbent length and head girth of newborn

Results

The 310 newborns have been divided into three groups (Table 1.). In the first one those newborn babies have taken part whose artificial conceptions have been timed on 10th, 11th or 12th day of the cycle. The second group, babies had the AID on the 13th, 14th and 15th day of the cycle and the third group babies were concepted artificially on the 16th 17th and 18th days. Cases with insemination before the 10th or after the 18th day of the cycle were excluded from this study.

The newborn babies in these three groups show different sex ratio (Table 1.). Therefore we could confirm of the known data of the literature that inseminations made in the middle of the cycle produce a shift to the girls in sex ratio. At the same time the inseminations made before or after the middle time produce a shift to the boys. The sex ratios can be presented by an „U"- shaped curve (Fig. 1).

The other four data were also divided in the above mentioned groups respectively.

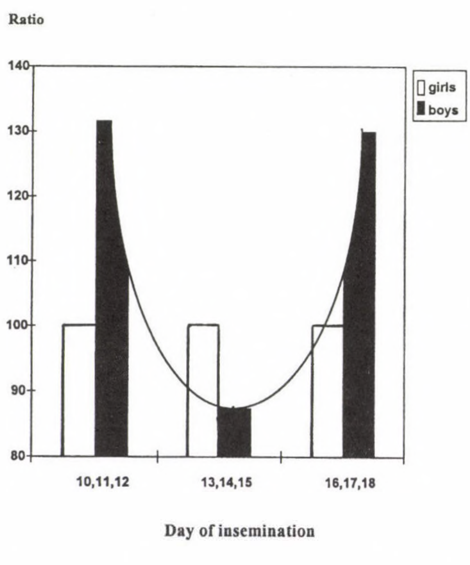

Table 1: Number and ratio of sex according to the AID

Time Day	female n	female %	male n	male %	ratio
10-12	19	43.2	25	56.8	100:131.6
13-15	127	53.4	111	46.6	100: 87.4
16-18	10	43.5	13	56.5	100:130.0
Together	156	50.3	149	49.7	100: 98.7

Table 2: Gestational time (day)

group	boys $\bar{x}$	boys SD	girls $\bar{x}$	girls SD
I.	262.9	10.4	265.8	8.2
II.	260.6	12.3	261.6	12.7
III.	262.0	7.3	252.4	9.9

Table 3: Birth weight (gr)

group	boys $\bar{x}$	boys SD	girls $\bar{x}$	girls SD
I.	3593.6	277.6	3340.4	365.8
II.	3176.4	552.0	3130.2	559.4
III.	3396.1	361.2	2991.9	742.7

Table 4: Recumbent lenght (cm)

group	boys $\bar{x}$	boys SD	girls $\bar{x}$	girls SD
I.	53.3	2.4	53.6	1.0
II.	52.5	4.0	52.8	4.2
III.	54.1	2.1	51.7	4.8

Table 5: Head girth (cm)

group	boys $\bar{x}$	boys SD	girls $\bar{x}$	girls SD
I.	35.4	1.1	34.4	0.7
II.	34.0	1.3	33.7	1.5
III.	34.5	0.5	32.5	1.8

$P < 0{,}05$

The mean of gestational time space (Table 2) seems to be shorter that of those counted by gynaecologists, because of the different method. The length of this period was counted here from the exact date even the hour of conception to the delivery and not from the first day of the last menstruation. Significant difference were found by Studtent *t*-test between boys' and girls' gestational time space if we don't exclude the cases with insemination before the 10th or after the 18th day of the cycle. Without these cases, we did not find significant differences among the six groups.

The birth weight (Table 3) is much more higher in any groups than that of the border of prematurity. Significant differences were found in these relations by analysis of variance.

Averages of recumbent length (Table 4) are also in the normal range.

Averages of the head girth (Table 5) are also in the „normal" range is any group, but significant differences between the boys and girls were also found in this measurements.

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Anthrop. Közl. *38;* 149-155. (1996/97)

THE PREVALENCE OF OBESITY AND SUPER OBESITY AMONG SCHOOLCHILDREN OF PÉCS IN THE 1990-S

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Abstract: *The prevalence of obesity was determined by the data of the Second Pécs Growth Study (Dóber), in which a cross- sectional anthropometric survey was carried out in a representative sample of 3414 school children aged 6-18 years in the school year of 1993-94 in Pécs, a town with the population of 180 000.The prevalence values were determined by two types of methods, by triceps skinfold and by body mass index (BMI). In case l, obese children were determined as those with triceps skinfold greater or equal with 90th percentile of the triceps standard of Tanner and Whitehouse (1975) and super obese children as those with greater or equal with 97th percentile of the same standard. In case 2, obese children were defined as those with BMI greater or equal with 90th percentile of the local BMI standard (Dóber 1992) and super obese children as those with greater or equal with the 97th percentile of the same BMI standard. The mean prevalence of obesity in the whole sample as determined by triceps skinfold (TS≥90p) was l6,3%, and 13,2% by the BMI (BMI≥90p).There were no significant differences between boys and girls. The mean prevalence of super obesity was 5,9% and 4,0% as determined by triceps skinfold and BMl, respectively. These data shown that the prevalence of both obesity and su- per obesity has increased during the last decade. The results confirm that effective preventive measures are badly needed to stop or reverse the increase of prevalence of obesity in Hungary.*

Key words: *Obesity; BMI; Pécs children*

Introduction

The population of Hungary has been decreasing, from time to time, according to the data of Central Statistical Office (Hungarian Annual of Statistics,1993). The „life expectancy at birth", „the risk of death between 15 and 59" and other statistical health measures have been continuously worsening in Hungary as in the other so called „formerly socialist economies" as in Hungary (Feachem 1994). The increasing trend of morbidity and mortality is partly due to the high rate of cardiovascular diseases which are frequently accompanied by obesity. The prevalence of obesity in the adult population of Hungary was 25% in the middle of 1980s as reported by the First Hungarian Nutritional Survey (Bíró 1992-1993). Furthermore, Halmy (1984) revealed 39% prevalence of obesity in a cohort of chronically ill patients. In the 80s, 2,5-15,7% of schoolchildren were found to be obese (Bedö and Bihari 1981, Blatniczky 1994, Czinner et al. 1983, Dóber 1987, Jakabfi 1986, Jakabfi et al. 1986, Somogyi 1987, Wilhelm and Csombók 1983). On one hand, the clinical experiences in the 90s suggest that the rate of obesity is increasing and on the other that the cases seem to be the same in connection with the super obese children. Large survey in United States demonstrated that childhood obesity is becoming more and more frequent (Gortmaker at al. 1987).

The aim of the present study was to investigate the trend of the prevalence of childhood obesity in Hungary.

Patients and Methods

The prevalence of obesity was investigated using the data of the Second Pécs Growth Study (Dóber, publication is in progress), where a cross-sectional anthropometric survey was carried out in a representative sample of 3414 (male: 1856, female: 1558), 6 to 18 year old school children in the school year of 1993-94 in Pécs, a town in South-Hungary with a population of 180 000. The methodology of this study was similar to that of the First Pécs Growth Study made in the 1983-84 school year (Dóber and Jeges 1987, Dóber 1991, 1992). The anthropometric techniques were in accordance with internationally accepted standards described by Martin and Saller (1957) and by the International Biological Program (Tanner et al. 1969). Only healthy children were included. Those suffering from any chronic disease, congenital defects or endogen type of obesity, as in the first one, also were excluded from the study.

The prevalence of obesity was determined by two methods. In the first case the criteria of obesity was the triceps skinfold (TS) being equal with or greater than the 90th percentile of the Tanner and Whitehouse' standard (1975). Children whose skinfold values were equal with or greater than 97th percentile were considered super obese. In the second case the BMI was used to define obesity. Obese children were those whose BMI was equal with or greater than the 90th percentile of the BMI Standard of the First Pécs Growth Study (Dóber and Jeges 1987), and the ones whose BMI was 97th percentile or greater were defined as super obese.

Data are expressed as mean ±SD or mean ±SE. Statistical significance of differences between mean values of the different groups was tested by using Students' paired t-test.

Results

The first two tables summarise the results obtained by using the TS standard. The data of the obese children determined by TS ($TS \leq 90p$), can be seen in the table 1.

Altogether 3414 children were investigated of which 1856 were boys and 1558 were girls. The total number of obese children was 538, of which 314 were bays, and 234 were girls. The mean of the prevalence of obesity in the academic year of 1993-94 was 16,3 % in the whole cohort, 17,4 % among the boys and 16.3 % among the girls. Statistically the difference between sexes was not significant.

The data of the super obese children determined by TS, can be seen in the table 2. The total number of super obese children was 198, of which 122 were boys and 76 were girls. The prevalence of super obesity was 5,9%, 6,8 and 4,9% in the whole cohort in boys and in girls, respectively. According to the results the rate of super obesity in boys was significantly higher than in girls ($p<0.01$).

Table 1: The Prevalence of Childhood Obesity of Pécs's School-children by Triceps Skinfold in the 1993-94 Academic Year

Age (Years)	Total Number of Children	Total Number of Obese Children	Total Prevalence of Obesity (%)	Number of Boys	Number of Obese Boys	Boys's Prevalence of Obesity (%)	Number of Girls	Number of Obese Girls	Girl's Prevalence of Obesity (%)
6	241	33	13.7	119	14	11.8	122	19	15.6
7	225	33	14.6	125	19	15.2	100	14	14.0
8	230	33	14.6	128	16	12.5	102	17	16.7
9	228	31	17.5	125	29	23.2	103	12	11.7
10	235	54	23.0	119	35	29.5	116	19	16.4
11	227	37	16.4	117	17	14.6	110	20	18.2
12	244	47	19.7	116	32	27.6	128	15	11.8
13	239	45	18.8	104	19	18.3	135	26	19.3
14	387	58	15.0	239	36	15.1	148	22	14.9
15	205	34	16.6	101	14	13.9	104	20	19.3
16	342	49	14.3	211	31	14.7	131	18	13.8
17	362	51	14.0	228	33	14.5	134	18	13.5
18	249	33	13.3	124	19	15.4	125	14	11.2
Total:	**3414**	**538**		**1856**	**314**		**1558**	**234**	
Mean:			**16.3**			**17.4**			**15.1**
SD:			**2.85**			**5.70**			**2.78**
SE:			**0.79**			**1.58**			**0.77**

Table 2: The Prevalence of Childhood Superobesity of Pécs's School-children by Triceps Skinfold (TS) in the 1993-94 Academic Year

Age (Years)	Total Number of Children	Total Number of Super Obese Children	Total Number of Children (%)	Number of Boys	Number of Super Obese Boys	Boys's Prevalence of Super Obesity (%)	Number of Girls	Number of Super Obese Girls	Girls's Prevalence of Super Obesity (%)
6	241	15	6.2	119	6	5.0	122	9	7.5
7	225	11	4.9	125	8	6.4	100	3	3.0
8	230	19	8.3	128	10	7.9	102	9	8.9
9	228	14	6.1	125	12	9.6	103	2	2.0
10	235	18	7.7	119	11	9.3	116	7	6.1
11	227	12	5.3	117	6	5.2	110	6	5.5
12	244	14	5.7	116	9	7.8	128	5	4.0
13	239	18	7.5	104	7	6.8	135	11	8.2
14	387	27	7.0	239	20	8.4	148	7	4.8
15	205	10	4.9	101	5	5.0	104	5	4.8
16	342	15	4.4	211	7	3.4	131	8	6.2
17	362	15	4.1	228	14	6.2	134	1	0.8
18	249	10	4.0	124	7	5.7	125	3	2.4
Total:	**3414**	**198**		**1856**	**122**		**1558**	**76**	
Mean:			**5.9**			**6.8**			**4.9**
SD:			**1.41**			**1.85**			**2.47**
SE:			**0.39**			**0.51**			**0.69**

The figure 1 and the table 3 demonstrate the changes in the prevalence of obesity (left hand side) and super obesity (right side) determined by TS in the 1983-84 and in the 1993-94 school year. The mean prevalence of obesity in both sexes has increased from 11,8% to 16,3% during the last decade. The prevalence of obesity has increased from 13,1% to 17,4% in boys and from 10,4% to 15,1% in girls. The trend of changes was similar in both genders. The prevalence of super obesity has increased from 3,4 % to 5,9 % in the whole cohort, from 3,6 % to 6,7 % in boys and from 3,1% to 4,9% in girls. The increase of super obesity was significantly higher in boys than in girls.

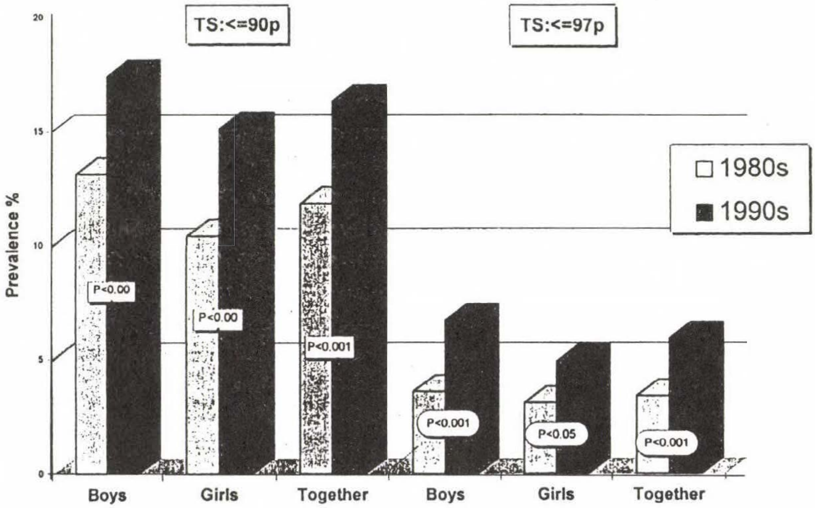

Fig. 1: The prevalence of childhood obesity in the town of Pécs determined by *triceps skinfold* in 1980s and in 1990s. The black columns represent the mean values obtained in 1980s, and white columns the values in 1990s. Left hand side of the figure: *triceps skinfold (TS)* ≤ 90p, right hand side: *TS* ≤ 97p.

Table 3: Changes in the Prevalence of Childhood Obesity by Triceps Skinfold (TS) between 1980s and 1990s

	TS ≤ percentiles							TS ≤ percentiles						
	1980s			1990s				1980s			1990s			
	Mean	SD	SE	Mean	SD	SE	Level of significance	Mean	SD	SE	Mean	SD	SE	Level of significance
Boys	13.1	3.3	0.92	17.4	5.7	1.58	***	3.6	1.31	0.08	6.7	1.85	0.51	***
Girls	10.4	2.3	0.64	15.1	2.78	0.76	***	3.1	1.62	0.15	4.9	2.47	0.77	*
Together	11.8	2.2	0.61	16.3	2.85	0.79	***	3.4	1.01	0.08	5.9	1.41	0.39	***

* : $p < 0.05$
** : $p < 0.01$
*** : $p < 0.001$

Table 4 shows the main data of obesity prevalence obtained by using BMI. Altogether we found 461 obese children (250 boys and 211 girls). The mean prevalence of obesity in the academic school year of 1993-94 was 13,2% of the whole group, 12,8% among boys and 13,4% among girls. The difference between sexes was not significant.

Table 4: The Prevalence of Childhood Obesity of Pécs's School-children by Body Mass Index (BMI) in the 1993–94 Academic Year

Age (Years)	Total Number of Children	Total Number of Obese Children	Total Prevalence of Obesity (%)	Number of Boys	Number of Obese Boys	Boys's Prevalence of Obesity (%)	Number of Girls	Number of Obese Girls	Girl's Prevalence of Obesity (%)
6	241	31	12.9	119	6	5.0	122	25	20.7
7	225	23	10.2	125	18	14.4	100	5	5.0
8	230	32	13.9	128	20	15.7	102	12	11.8
9	228	20	8.8	125	11	8.8	103	9	8.8
10	235	37	15.7	119	21	17.7	116	16	13.8
11	227	17	7.5	117	7	6.0	110	10	9.1
12	244	25	10.2	116	5	4.4	128	20	15.7
13	239	19	7.9	104	10	9.7	135	9	6.7
14	387	39	10.1	239	24	10.1	148	15	10.2
15	205	31	15.1	101	14	13.9	104	17	16.4
16	342	77	22.6	211	49	23.4	131	28	21.4
17	362	64	17.7	228	41	18.0	134	23	17.2
18	249	46	18.5	124	24	19.4	125	22	17.6
Total:	**3414**	**461**		**1856**	**250**		**1558**	**211**	
Mean:			**13.2**			**12.8**			**13.4**
SD:			**4.6**			**5.98**			**5.26**
SE:			**1.28**			**1.66**			**1.46**

The data of the super obese children determined by BMI are presented in table 5. The number of super obese children was 143, of which 92 were boys and 51 were girls. The prevalence of super obesity was 4,0%, 4,6% and 3,6% in the whole cohort, in boys and in girls, respectively. No sex difference in the rate of super obesity was found.

Discussion

The results of the present study demonstrated a marked increase in the prevalence of both the obesity and super obesity among children of Pécs. The careful analysis of the data suggest that the increase in prevalence of obesity might be the consequence of the increase in the prevalence of super obesity.

Our data confirm the results reported in the other population (Gortmaker et al. 1987). Although childhood obesity accounts for only 30-40% of adult obesity (Mullins 1958, Abraham et al. 1979), adults obese as adolescents constitute a majority of the heaviest adults (Rimm and Rimm 1976). Therefore, childhood obesity may contribute a disproportionate share of morbidity and mortality of adult obesity, making grater risk for developing of Syndrome „X" (Dean et al.1991, Suba et al. 1994). Our data confirm that effective preventive measures are badly needed to stop or reverse increase of the prevalence of obesity in Hungary.

Table 5: The Prevalence of Childhood Superobesty of Pécs's School-children by Body Mass Index (BMI) in the 1993-94 Academic Year

Age (Years)	Total Number of Children	Total Number of Super Obese Children	Total Prevalence of Super Obesity (%)	Number of Boys	Number of Super Obese Boys	Boys's Prevalence of Super Obesity (%)	Number of Girls	Number of Super Obese Girls	Girl's Prevalence of Super Obesity (%)
6	241	8	3.3	119	1	0.9	122	7	5.8
7	225	4	1.8	125	4	3.2	100	0	0
8	230	11	4.8	128	5	4.0	102	6	5.9
9	228	6	2.6	125	6	4.8	103	0	0
10	235	16	6.8	119	9	7.6	116	7	6.1
11	227	2	0.9	117	1	0.9	110	1	1.0
12	244	5	2.0	116	2	1.8	128	3	2.4
13	239	9	3.8	104	4	3.9	135	5	3.8
14	387	14	3.6	239	8	3.4	148	6	4.1
15	205	7	3.4	101	3	3.0	104	4	3.9
16	342	34	10.0	211	27	12.9	131	7	5.4
17	362	14	3.9	228	12	5.3	134	2	1.5
18	249	13	5.2	124	10	8.1	125	3	2.4
Total:	3414	143		1856	92		1558	51	
Mean:			4.0			4.6			3.3
SD:			2.36			3.33			2.21
SE:			0.65			0.92			0.61

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Anthrop. Közl. *38;* 157-164. (1996/97)

SEXUAL MATURATION, INTELLIGENCE AND SELF-ASSESSMENT

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Abstract: *The purposes of the study were:*

1. To investigate the connection between the sexual maturation and intelligence as an indicator of the mental development.

2. To study whether the real differences in sexual maturation are accompanied by a change of the subjective self-evaluated of the body shape.

3. To analyse the influence of the rapid or slow maturation on the subjective self-assessment.

4. To contribute toward the answer to the interpersonal attitudes of early and late maturing girls.

The cross-sectional sample consists of 387 girls aged 10-14 years, all of them belonging to a middle socio-economical level. In assessing secondary sex characteristics Tanner's suggestions were followed. The median stage of maturation was based on the inter-age-group distribution of the development of breast and pubic hair. The menarcheal age was estimated by the probit-analysis. IQ estimates were obtained by adult version of the perceptive non-verbal test of Raven. The subgroup differences were analyzed by the Student t-test, Hotteling T^2 *- and* χ^2 *-tests.*

Key words: *Sexual maturation; Intelligence; Self-assessment; Interpersonal attitude.*

Introduction

Puberty, the transition between childhood and youth, has always attracted the attention of researchers interested in growth. It is a hormonally unstable period of life, with dramatic dimensional changes and a fast rate of sexual development. Differences between boys and girls become accentuated, but even children of the same sex display marked dissimilarities if their rate of growth and maturation differs.

Changes in the shape and structure of the body, the appearance of the secondary sex characteristics usually associate with psychic imbalance as well as increased self-awareness (Tanner 1961). Identification with one's sex-dependent morphology might be a problem also for the child of average development (Jones and Mussen 1958, Faust 1960, Kohen-Raz 1974, Matsudo et al. 1994), and an even greater one for those differing from the average rate. In children of accelerated growth some studies pointed out a faster rate of mental development (Jones 1957, 1958, Lindgren 1978, Bodzsár 1981, Bodzsár and Pápai 1993) and peculiar dissimilarities in behaviour and emotions (Stone and Barker 1937, 1939, Jones and Bayley 1950, Davidson and Gottlieb 1955, Mussen and Jones 1957, Duke et al. 1980).

Of the very complex and intricate interactions of pubertal development the present paper reports on

1. some connections observed between sexual maturation and perceptive intelligence as a measure of mental development;
2. the relationship between objective morphology and subjective self-image;
3. the effect of non-average start and rate of development on self-concept;

4. the impact of higher or lower perceptive intelligence on the identification with one's morphology in early and late maturers; and
5. the effects of early and late maturation on interpersonal relationships.

Material and methods

The study comprised 387 girls aged between 10 and 14, all of them belonging to a middle socio-economic level.

Stage of maturation was estimated in two ways: pre- or post-menarcheal condition, respectively the developmental stage of the secondary sex characteristics. In the latter, children with stages above the median of pubic hair and breast development within an age group were considered early maturers, those below it late maturing ones. In assessing secondary sex characteristics Tanner's suggestions (1962) were followed. In calculating median age at menarche „maximum likelihood" probit regression was used (Weber 1964).

Mental development and intelligence was estimated by using the adult version of Raven's perceptive non-verbal test. Scores below 38 were taken as a low level of intelligence, ones between 38 and 43 as medium, and scores above 43 as a high level of non-verbal intelligence. Categories of the Raven scores were contrasted with menarcheal status, early and late maturation and identification with one's femininity.

To assess the subjective perception of femininity Machover's self-portrait method was used which among others assigns a femininity score ranging between 1 and 25 to each drawing. Every girl was given a sheet of white writing paper with the instruction: „Make a drawing of yourself! Nobody expects you to be an artist, we don't care about your dexterity and drawing skills. Do not bother if it is not perfect!". Spontaneous expression of femininity scores were averaged for the late and early maturers in secondary sex characteristics. Another aspect of the Machover's method utilized in this study was negativism of self-image ranging between 1 and 20, higher scores expressing a greater extent of refusing one's prevailing morphology.

To estimate the prestige of late and early maturers among the peers a 25-item questionnaire was filled in by the subjects, this was used to make sociograms within the school class.

The level of significance in comparing group means was set at 5%. Hotelling's T-square multivariate analysis was employed to disclose group differences.

Results

Sexual maturation

Median age at menarche was found to be 12.89 ± 0.12 years. Figure 1 shows the age distribution of pre- and post-menarcheal girls.

In the studied age interval a linear progress of secondary sex characteristics was found, breast development starting earlier than that of pubic hair. By the age of 14 secondary sex characteristics of the sample reached 80% of adult maturity by displaying stages ranging between 2 and 4.

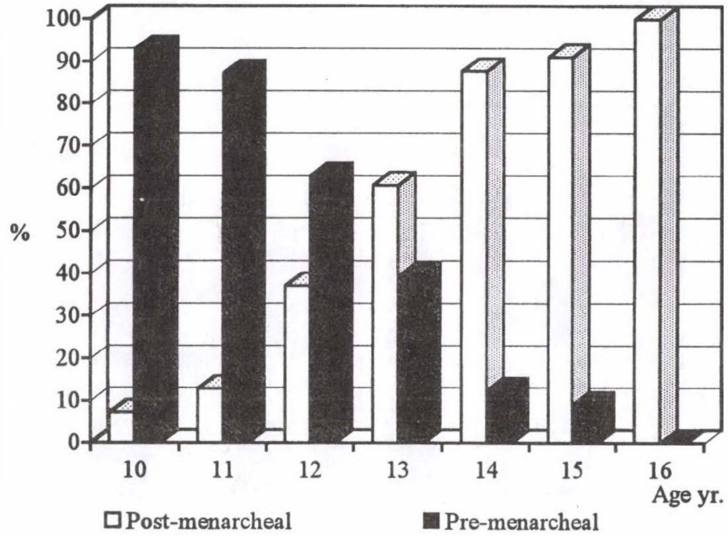

Fig. 1: Distribution of the menarcheal and non-menarcheal girls according to age

Mental performance level and sexual maturation

Post-menarcheal girls in every age group had a significantly higher mean score in the Raven test (Fig. 2).

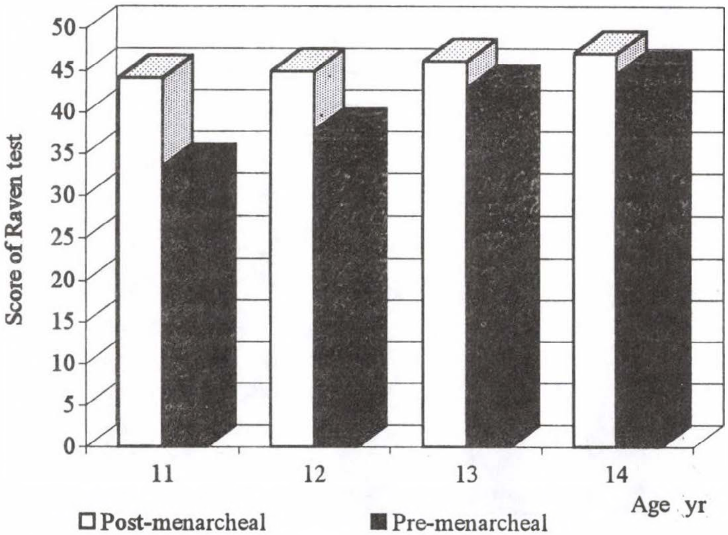

Fig. 2: Pre- and post-menarcheal girls' performance in Raven test

In respect of the secondary sex characteristics, early maturers always scored better except for the age of 14 (Fig. 3).

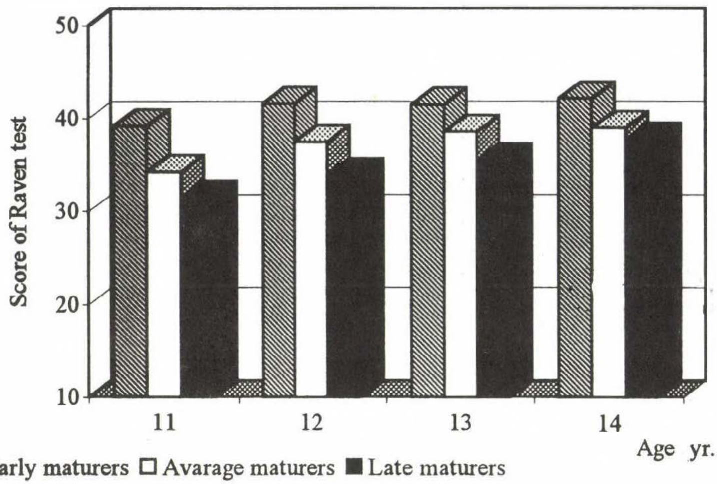

Fig. 3: Score of Reven test vs. maturation rate

Femininity scores vs. maturation rate

The main point of interest was whether subjective perception of femininity agreed with the morphological expressions of maturation. Means of subjective femininity scores contrasted with the categories of early and late maturers are shown in Figure 4..

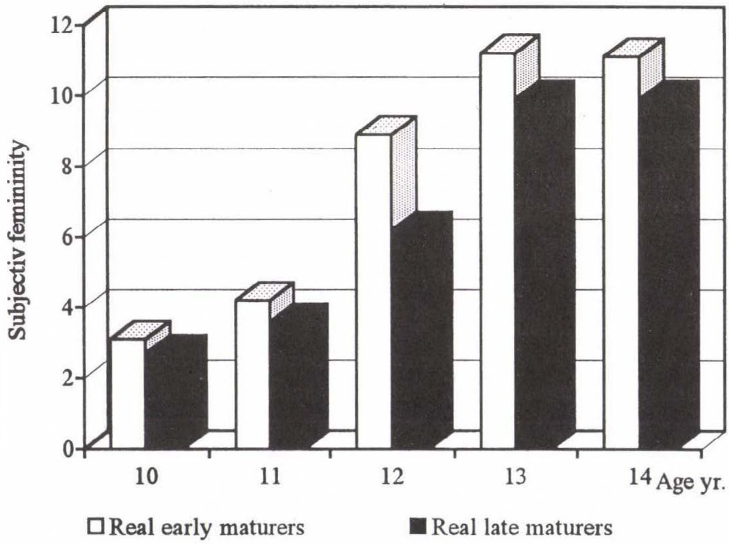

Fig. 4: Subjectiv femininity scores vs. maturation rate

It was found that the subjective perception of the body scheme did not agree with morphological reality. Except the age of 12 marked objective differences in maturation were not reflected in the self-image. Late maturers tended to overestimate while early maturers to underestimated the femininity of their body. On the other hand, subjective perception of femininity progressed with advancing age and maturity status at almost the same rate in both groups.

Refusal of prevailing morphology (negative attitude to self-perception) did not differ between early and late maturers (Fig. 5). The fact that all such scores were low indicated that body morphology did not play an essential part among the factors leading to a negative self-concept at these ages.

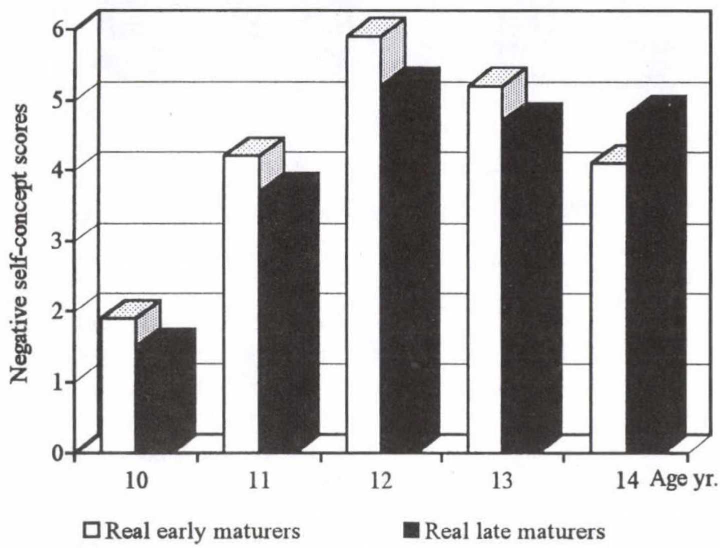

Fig. 5: Negative self-concept scores vs. maturation rate

Relationship of subjective femininity and mental development

The question of whether children scoring higher in intelligence tests perceived less femininity in themselves was aroused by some reports stating that in adults of higher intelligence physical attributes of femininity or masculinity were considered less important reports (Piaget 1972, Weber 1976). The contingency coefficient showed a negative relationship between mental performance and perceived femininity so children of better Raven scores displayed indeed lower means of feminine attributes in their self-portraits (Fig. 6).

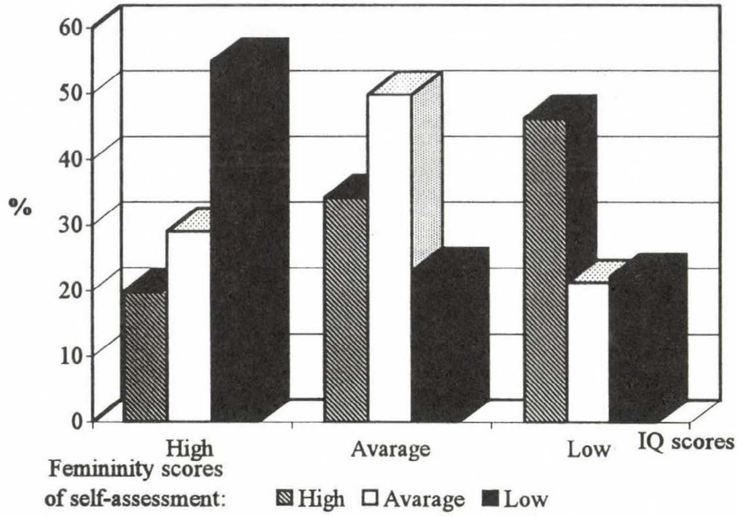

Fig. 6: Femininity scores of self-evaluation vs. IQ scores

Maturation and social prestige

Some studies on the later personality of children reported that early maturers were more sociable and more successful in society than late maturers(Jones and Bayley 1950, Jones 1957, Tanner 1961, Shipman 1964, Kiernan 1977). In this study sociogrammatic items of social prestige were first analyzed only for early and late maturation, irrespective of age. No significant differences were found in the distribution of high average and low social prestige among early, average and late maturers (Fig. 7).

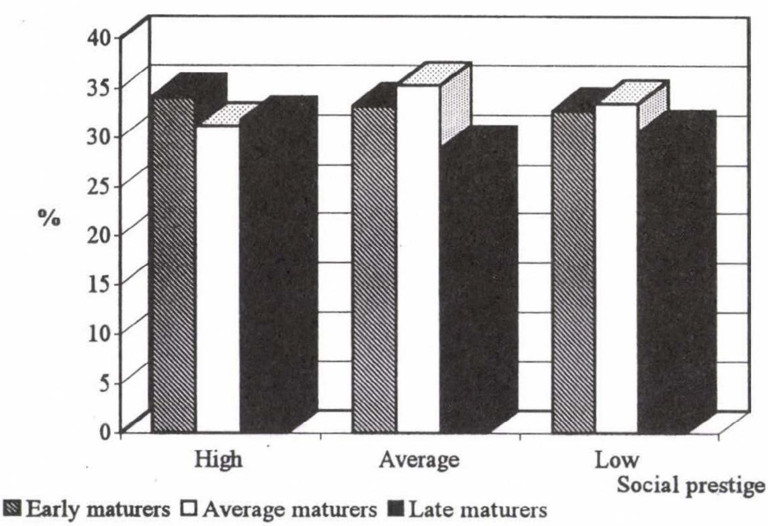

Fig. 7: Social prestige vs. maturation rate

However, when mean scores of social prestige were analyzed by age groups, another pattern emerged. While late maturers had a higher acceptability until age 11, late maturers scored significantly and progressively better after the age of 12. In the latter ages the prestige of late maturers was almost constant.

Conclusions

In answer to the problems studied the following inferences were drawn.

1. In agreement with other reports and our previous studies, accelerated physical development was associated with a faster rate of mental development, thus mental performance paralleled the rate bodily development.

2. A disagreement between morphological status and expressed self-perception of femininity was observed. Physical maturation was unreflected in the prevailing subjective self-image although progressive maturation was followed by an increase of femininity signs with advancing age. It appeared that the development of the body scheme was yet unfinished in this period of life.

3. Deviations from an average maturation rate, either in the sense of acceleration or retardation, that is, an absence or expressed presence of feminine attributes were unimportant in the development of a negative self-concept in this age range.

4. Late maturers of higher intelligence were found to display a better concordance between the morphology of maturation and expression of perceived femininity while lower mental performance capacity rather reversed this relationship. In this way, better information capacity may help to accept missing femininity in late maturers while those scoring lower in mental performance cannot compensate for their lack of femininity so are less ready to identify with their morphology.

5. The influence of rapid and slow maturation on interpersonal attitudes in the reference group depended on age. Early maturers were rated much lower in social prestige until 11 years of age, but progressively higher than their late maturing peers as age advanced.

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Anthrop. Közl. *38;* 165-170. (1996/97)

EFFECT OF MATURITY AT BIRTH ON THE CHILD BEHAVIOR

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Abstract: *The authors reported on the problems in behaviour in correlation with the maturity at birth (358 Small for Gestational Age, SGA; 3237 Appropriate for Gestational Age, AGA; 399 Large for Gestational Age, LGA) of children aged 11-14, which were established by employing a dimensional questionnaire of child psychiatry.*

The comparison of the body mass, head circumference, and Body Mass Index at birth and at age of 10 presents both in the case of boys or girls significantly smaller values in the SGA group than in the AGA group. We can speak of catch-up growth only in the case of children with small weight inside the AGA group.

As regards Child Behaviour Checklist (CBCL) SGA children were scored by parents significantly higher on total problems, attention problems, externalization and low on competence scales.

Boys were rated significantly higher on activity, social problem, attention problem, delinquency, aggression, externalization and total problem scales.Girls were rated significantly higher on academic achievement (school scale).

Key words: *Small for Gestational Age; Appropriate for Gestational Age; Large for Gestational Age; Child Behaviour Checklist.*

Introduction

The continuous follow-up study and proper appreciation of children's growth and progress is of outstanding significance, especially in the case of children with a body mass less than 2500 g and still more in the case of children with a birth weight small for gestational age (SGA). The more immature is the new-born, the less is his body mass the more his health status in his later age and his prospects of life are endangered.

The prognosis in terms of catch-up growth in children born small for gestational age is a central theme of numerous studies of pediatricians and human biologists (Ágfalvi et al. 1990, Qvistad et al. 1993, Albertsson-Winkland et al. 1993, Darvay et al. 1994).

The aptitude to learn, performance in school, neuromotoric function, congenital malformation, hearing, visual function, language and speech development behaviour were the object of numerous studies (Westwood et al. 1983, Elliman et al. 1991, Veen et al. 1991, Halsey et al. 1993).

In this study we report on the problems in behaviour in correlation with the maturity at birth and some anthropometric data of children entering in puberty established by employing a dimensional questionnaire of child psychiatry.

Material and Methods

Our data were supplied by the National Longitudinal Growth Study resp. by the results of the transversal dimensional questionnaire of child psychiatry connected with the abovementioned study.

The study of children's growth, a common programme of the National Institute of Child Health and the Central Statistical Office, Demographic Research Institute began in November 1979 entitled as "Health and Demographic Study of Pregnant Women and Infants". In the survey carried out between 1979-82, the data of 8200 pregnant women were collected in a representative sample of 2%, and later on detailed socio-demographic, anthropometric and morbidity data of nearly 7000 children born between 1980-83 in the capital and in seven counties were collected.

The longitudinal growth study was completed in 1994 by a cross-sectional survey of behaviour of 4412 11-14 year old children. For the collection of data we have chosen the Child Behaviour Checklist (CBCL) elaborated by the American author Thomas M. Achenbach (1991). Considering the children's age and the possibilities of the survey, the version of the checklist supplied by the answers of the parents was regarded as the most appropriate.

The checklist is divided in two parts. In the first part, the questions refer to the child's activity (hobbies, sport, etc), relations with friends and inside the family, results in school.

The values of the answers offer the scale-values of activity, school and social relations. The summation of these values offers the so-called value of competence which informs on the child's performance and competence in the various human and material environments.

The second part of the checklist contains 114 questions referring to the symptoms, problems and peculiarities in behaviour always observed in the previous six months. The sum of the values supplied by the answers to the questions offers the so-called problem-indicator. On the basis of the list of problems 9 scales can be formed: 1) withdrawn, 2) somatic complaints, 3) anxious, depression, 4) social complaints, 5) thought problems, 6) attention problems, 7) delinquent behaviour, 8) aggressive behaviour, 9) sexual problems. The 9th scale can not be evaluated above the age 12 . From the foregoing scales two more "derivative" indicators can be obtained: the internalization which is the sum of the first, second and third scales, and the externalization as the sum of the 7th and 8th scales. The dimensions of the child's problems in behaviour, of his psychiatric illness - his tendency toward himself or his environment - are characterised by the expressions "internalization" resp. "externalization" (Gádoros 1996).

In this study, we have evaluated the problems in behaviour according to the maturity at birth. In 418 cases it was impossible to establish precisely the maturity at birth, consequently in the course of subsequent analysis we took in consideration only 3994 cases. On the basis of the maturity at birth, we have formed three groups: 1) birth weight appropriate for gestational age, AGA (1675 boys, 1562 girls), 2) birth weight small for gestational age, SGA (170 boys, 188 girls), 3) birth weight large for gestational age, LGA (223 boys, 176 girls) (Joubert 1983). Between the anthropometrical data we compared the body mass, the head circumference and the Body Mass Index (BMI) at birth with those at the age of 10 years.

In order to examine possible sex and birth maturity differences in the anthropometrical variables and probleb behaviours we conducted separate two way [2 (sex:boys/girls) X 3 (birth maturity: SGA, AGA, LGA)] and one way ANOVA's using the total score of each problem and competence scales as the dependent variables. The data were analysed by the SPSSX computer package (SPSS Inc., 1986).

Results and Discussion

The behaviour, mental health or illness of the child is being formed by manyfold complex biological, psychological and social effects having a mutual impact on each other. Naturally, the survey based on the answers of the parents can give a basis only by manyfold transfers for the appraisement of the psychic, mental state of the children.

In our analysis, besides the answers given to the questions, we have made use of some data of the longitudinal research. In this study, we would like to compare several of these facts.

The comparison of the body mass, head circumference and BMI at birth and at age 10 of the children born with different maturity at birth presents, both in the case of boys or girls, significantly smaller values in the SGA group than in the AGA group.

The comparison of the anthropometric date presents, until 6 years of age, similar results in the case of other body measures (triceps, subscapular, head circumference according to age) (Darvay et al. 1991, Joubert et al. 1994). Thus, our earlier results, seem also to justify that, in the sphere of somatic maturity, we can speak of catch-up growth only in the case of children with small weight inside the AGA group. In all groups of age, the significant difference between the sex presents greater values in the case of boys.

As in the case of the anthropometric data, some index of behaviour presents a significant difference between boys and girls .We have found a very strongly significant difference ($p<0.01$) in the scale of activity and the academic achievement.The boys are more active, the girls are achieving better results in learning. From the 9 scales of the problem list, the social problem, the attencion problems, the delinquent and aggressive behaviour have presented significantly greater differences ($p<0.01$) (that is a greater number of problems) in the case of boys. Likewise, the total problem score presents a greater differences in the case of boys. We have not found a statistically justified difference in the scales of social activity, total competence, withdrawn, anxiety, depression (Table 1).

Table 1: Influence of gender differences on Problem Behavior and competence

SCALES	Boys Mean	Boys Std. Dev.	Girls Mean	Girls Std Dev.	Significant effects of oneway ANOVA ***p < .000, *p < .05
Activity Scale	4.02	1.92	3.80	1.92	F(1,4384)=12.05***
Social Scale	6.02	1.72	5.96	1.79	
School Scale	4.84	.96	5.08	.86	F(1,4382)=58.66***
Total Competence Score	15.08	3.35	15.04	3.39	
Withdrawn	1.53	1.84	1.52	1.74	
Anxious/Depressed	1.69	2.38	2.11	2.44	
Somatic Complaints	.71	1.15	.85	1.28	F(1,4380)=4.43*
Social Problems	1.08	1.36	.98	1.35	F(1,4383)=10.20***
Attention Problems	2.33	2.37	1.62	1.90	F(1,4383)=88.76***
Delinquent Behavior	1.10	1.48	.67	1.05	F(1,4387)=90.90***
Aggressive Behavior	3.95	3.64	3.25	2.94	F(1,4387)=38.72***
Externalizing	6.04	5.47	4.49	4.14	F(1,4380)=85.45***
Internalizing	4.15	4.27	4.42	4.34	
Total problems	14.41	11.31	12.98	10.04	F(1,4354)=12.05***

We have analysed by one way ANOVA the relationship between the indices of the groups according to maturity, and those of behaviour (Table 2).

Table 2: Effects of Birth Maturity on Competence and Problem Behaviour
* Significant one-way ANOVA results

SCALES	SGA		AGA		LGA	
	M	SD	M	SD	M	SD
Activity	3.68	2.05	3.89	1.90	3.93	1.88
Social Activity	5.74	1.74	6.01	1.75	6.03	1.82
School	4.74	1.10	4.98	0.90	5.08	0.75
Total Compet.Score*	14.36	3.71	15.07	3.31	15.24	3.32
Withdrawn	1.75	1.95	1.48	1.77	1.57	1.80
Anxious/Depressed	2.25	2.36	2.00	2.41	2.01	2.47
Somatic Complaints	0.83	1.32	0.77	1.22	0.86	1.19
Social Problems	1.12	1.39	1.01	1.35	1.09	1.28
Attention Problems*	2.47	2.59	1.93	2.15	1.88	1.90
Delinquent Behaviour*	1.03	1.42	0.86	1.30	0.81	1.12
Aggressive Behaviour	3.91	3.55	3.53	3.27	3.52	3.21
Externalization*	5.91	5.28	5.16	4.87	4.37	4.17
Internalization	4.76	4.41	4.19	4.31	4.37	4.17
Total Problems*	15.26	11.42	13.40	10.69	13.82	9.91

On the scale of total competence, very significant difference ($p<0.01$) is found in the SGA group (Figure 1). They are the less active in sports, their activity outside the school (plays, hobbies), are more restricted, the performances in the above-mentioned activities are, according to the parents, more weak. Problems in learning are mentioned by the parents in 36% of the SGA children, in 28% of the AGA and in 20% of the LGA children.

In the case of problems in learning, a sex-related difference is demonstrated by the analysis, but in the case of failures at examination (referring to more serious, special problems) the maturity at birth has a significant impact (Gádoros 1996). 21% of the failures at examination occurs in the SGA group, 11% in the AGA group and 6 % in the LGA group.

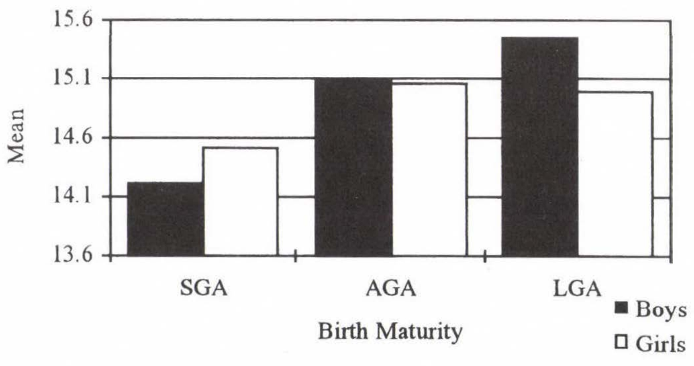

Fig. 1: Distribution of Total Competence scores by sex according to the SGA, AGA, LGA groups

From the 9 scales of the problem list the attention problems present in the SGA group statistically demonstrated strongly significant differences ($p<0.01$). E.g. the child can not sit still, is restless or hyperactive, can not concentrate, can not pay attention for long, day-dreams or gets lost in his/her thoughts, stares blankly.

In the case of externalization (delinquent and aggressive behaviour) it is again the SGA group which is presenting significant differences ($p<0.01$) . E.g. they are cruel to animals., they are commiting cruelties, they are bullying, harassing others, getting in many fights, setting fires, commiting acts of vandalism.

The total problem score demonstrate also a strongly significant difference $p<0.01$) in the SGA group (Figure 2).

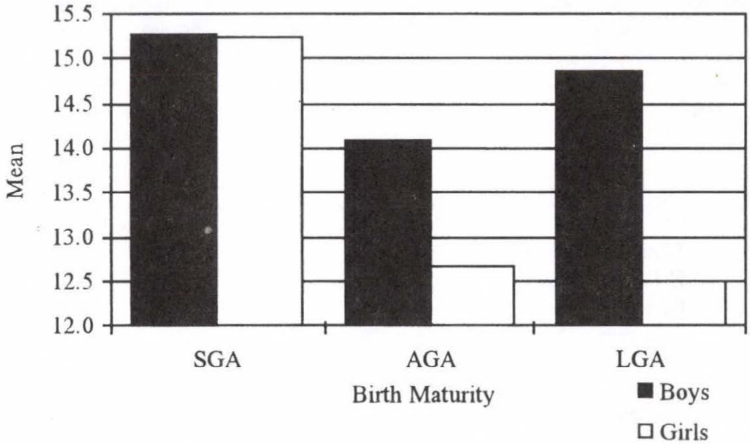

Fig. 2: Distribution of Total Problem scores by sex according to the SGA, AGA, LGA groups

What sort of factors have an impact on the immaturity at birth, to what extent these factors have an impact by themselves on the formation of the scale values - these questions are to be taken in consideration in a deeper analysis of the results mentioned in the present study and in the course of subsequent researches.

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Anthrop. Közl. *38;* 171-177. (1996/97)

PROBLEM BEHAVIOUR IN OVERWEIGHT PREADOLESCENTS

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Abstract: *Personality and psychological profile of groups of normal and overweight children from age 11 to 14 were compared. Weight groups were formed on the basis of the Body Mass Index, that had been assessed in subjects at birth and age 10. 4412 parents completed the Achenbach 's Child Behavior Checklist from which emotional and problem behavior could be derived. Social Withdrawal, Somatic Complaints and Social Problems were associated with overweight as measured by the Body Mass Index at age 10. Our results indicate that the socioeconomic variables such as education level of parents, family income, and dwelling place do not affect the overweight in children except for the number of siblings. Teasing from peers is more relevant for overweight boys, and not for girls according to the mothers ˇ report. Weight status at birth is only little associated with the weight status at age 10. This research is based on a Longitudinal Growth Study whose purpose is to examine perinatal, anthropometric, and demographic variables in a representative sample of Hungarian children.*
Keywords: *Overweight children; BMI; Child Behavior Checklist; Longitudinal Growth Study.*

Introduction

The great amount of research reported in the literature on overweight testifies to the relevance of the phenomenon. Obesity and overweight in adulthood are associated with increased mortality, hypertension, hypercholesterolemia, diabetes mellitus and coronary heart disease (Bray 1985, Garrison and Castelli 1985, Pi-Sunyer 1991). Overweight in childhood is a prevalent condition that increases risk of adult obesity (Abraham et al. 1971, Gortmaker et al. 1987, Mossberg 1989, Serdula et al. 1993, Guo et al. 1994). Obesity as an eating disorders is not classified by the Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R; American Psychiatric Association, 1980) because it "is not generally associated with any distinctly psychological or behavioral syndrome". Among others it has been found that obese children may exhibit socioemotional problems such as low self-esteem, low social competence, and moodiness. Child obesity has been found to be associated with behavioral problems such as conduct disorders, social withdrawal and peer rejection (Lerner and Schroeder 1971, Held and Snow 1972, Stein et al. 1987, Li 1995). However, this has not been supported by results given by research on general population. On the other hand, obese children do not differ from non-obese children on measures of psychological disturbance, levels of self-esteem, and psychological adjustment (Wadden and Stunkard 1985, Sallade 1973).

The study reported here focuses on the personality and psychological profile of normal and overweight children and also attempts to reveal some properties of parental evaluation of their child's weight when compared with an objective measure calculated from the children's height and weight (body mass index; BMI).

Subjects and Methods

Subjects: Being a part of the National Longitudinal Growth Study[1] whose purpose is to examine perinatal, anthropometric, and demographic variables in a representative sample of Hungarian children. In the present study 4412 parents described their 11-14 years old children's emotional and behavioral problems by the Achenbach's Child Behavior Checklist (CBCL; Achenbach 1991). Age of the children was from 11 to 14. (Mean=12.74; SD=0.93), 2131 were girls and 2281 were boys.

Measures: The children's emotional and behavioral problems were measured by the hungarian version of the widely used Child Behavior Checklist developed by Achenbach (Achenbach 1991, Gádoros 1996). The standardized rating scale of 114 items designed to obtain parents` reports of their child dealt with a wide range of problem behaviors such as Withdrawal, Anxiety/Depression, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Delinquency, Aggression beside which twenty competence items cover the child˝s activities, social relations, involvement in social organizations, school performance, and social competence. Total competence score is derived from the sum of Activity, Social and School scales. Problem items are scored by parents on a 3-point scale (a 0 if the problem item does not hold for the child, a 1 if the item is somwhat true or sometimes true, and a 2 if it has been very true or often true the preceding 6 months). Two broad-band groups of syndromes derivated from the problem scales, were designated as "externalizing" and "internalizing". Externalizing problems reflect conflicts with other people and is mainly composed of aggressive and delinquent behavior syndromes. Internalizing problems consist of the withdrawal, anxiety/depression and somatic complaints syndromes.

Children's weight and height at birth and at age of 10 are used to calculate a body mass index (BMI), which is defined as subject`s weight in kilograms divided by height squered in meters, which is also an anthropometric measure of obesity. BMI has been used widely in adults as a measure of overweight. However, several studies indicate BMI is not a reliable measure of fatness for children since BMI changes substantially with age, rising steeply in infancy, falling during the preschool years, and then rising again into adulthood (Rolland-Cachera et al. 1987, Siervogel et al. 1991, Bodzsár 1991, Kuczmarski 1993). In our sample the mean of BMI at birth was 12.76 (SD=1.19, N=5816) while the mean of BMI at age 10 was 17.35 (SD=2.92, N=4343). For the above reason, child BMI needs to be assessed using age related reference curves (Joubert et al. 1992, Cole et al. 1990).

Defining obesity or overweight for children is difficult, and there is no generally accepted definition of obesity or overweight for youth in the literature (Obarzanek 1993). Usually two percentile cutoff definitions were used to estimate overweight prevalence: 85th and 95th percentile. The 95th percentile of BMI clearly represents overweight and it is likely to have high specificity for excess body fat. The 85th percentile of BMI is more inclusive and has been used to set public health objectives for overweight prevalance among adolescents and is a widely used criterion of overweight for adults (Troiano et al. 1995, Kuczmarski 1994). We defined as overweight all children whose BMI was at the 85th percentile or greater in the recent study. We separated two BMI groups for statistical analysis: *normal-weight group* between the 15th percentile and 85 percentile (BMI at birth: N= 2580, 1203 girls, 1377 boys; BMI at age 10: N=2574, 1221 girls and 1353 boys), and *overweight group* (BMI at birth: N=566, 269 girls, 297 boys, BMI at age of 10: N=544, 259 girls, 285 boys) 85 percentile or greater than 85th percentile.

After obtaining various demographic data we restricted ourselves to using the following sorts of information: educational level of parents, mumber of siblings, family income and dwelling place.

Results

For both sexes, children who where classified as obese at age 11-14 years had had higher birth weights ($F(1, 3053)= 4.87$; $p<0.027$) than did the normal-weight group. Pearson correlation coefficient between BMI at birth and age 10 was $r = 0.12$ ($p< 0.000$, N=4228). Table 1 showes the frequency of cells in the crosstabulations of BMI at birth by BMI at age 10. Children who had been underweight at birth were near twice (1.7) as likely to become classified overweight at age 10 than not underweight children. In case of overweight newborn this risk ratio is poorer: 1.2. The sex separate analysis confirmed that the value of risk ratio is similar in both sexes.

Table 1: Crosstabulation of BMI at birth by BMI at age 10

		BMI at age 10			
		Underweight	**Normal-weight**	**Overweight**	**Row total**
BMI at birth	Underweight	143	399	78	620
	Normal-weight	359	1700	350	2409
	Overweight	46	384	96	526
	Column total	548	2438	524	3555

$\chi^2 = 49.16$, df=4, $p<0.0000$

As regards the socioeconomical variables these did not show significant effects for the weight of children except for the number of siblings ($F(1,3107)= 16.01$; $p<0.0001$). Obese children had significantly less siblings than the normal weight children.

Two-way analysis of variance (ANOVAs; 2(Sex: girls/boys) X 2(normal/overweight group) were conducted on the total score of problem and competence scales as dependent variables. Table 2. shows means and standard deviations for the different scales, and the various BMI groups (normal and oveweight).

Higher scores on Competence scales (Activity, Social Activity, School) indicate better adaptive functioning, while higher scores on the Problem Scales (Withdrawal, Anxiety/Depression, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Delinquency, Aggression) and the three calculated scores (Internalizing, Externalizing, and Total Problem) show maladaptive behavior/emotional problems. The results show significant effects for the separate sex groups in Activity, School, Attention Problem, Delinquent Behavior, Aggression, Externalization and Total Problem scales. Boys were rated as more active ($F(1, 3112)= 3.40$; $p<0.033$), inattentive ($F(1, 3113)= 65.88$; $p<0.000$), deviant ($F(1, 3114)= 48.49$; $p<0.000$) and aggressive ($F(1, 3110)= 34.46$; $p<0.000$) than girls. The boys were rated significantly higher in the Externalization ($F(1, 3110)= 62.10$; $p<0.000$) and Total Problem scores ($F(1, 3094)= 17.47$; $p<0.000$). Parent rated their daughter higher in the School achievment scale than their son ($F(1, 3110)= 60.96$; $p<0.000$).

Table 2: Means (M) and standard deviation (SD) of the different Competence and Problem scales

	normal-weight children		overweight children	
	M	**SD**	**M**	**SD**
Boys				
Activity	4.07	1.91	3.95	1.95
Social Activity	6.08	1.70	5.78	1.87
School	4.89	0.89	4.76	0.97
Total Competence Scores	15.24	3.25	14.67	3.71
Withdrawn	1.45	1.78	1.85	1.86
Anxious/Depression	1.93	2.39	2.19	2.46
Somatic Complaints	0.69	1.09	0.84	1.27
Social Problems	0.84	1.13	1.28	1.45
Thought Disorder	0.23	0.58	0.24	0.48
Attention Problems	2.29	2.36	2.36	2.21
Delinquent Behavior	1.10	1.46	1.13	1.59
Aggression	3.93	3.59	4.27	3.75
Externalization	6.03	5.44	6.61	5.87
Internalization	4.02	4.19	4.80	4.44
Total Problem Scores	14.01	11.07	16.97	11.99
Girls				
Activity	3.85	1.95	3.75	1.89
Social Activity	6.00	1.83	6.00	1.77
School	5.11	0.80	5.17	0.82
Total Competence Scores	15.14	3.44	15.14	3.25
Withdrawn	1.48	1.71	1.75	2.05
Anxious/Depression	2.09	2.33	2.11	2.95
Somatic Complaints	0.83	1.24	0.93	1.59
Social Problems	0.81	1.19	1.07	1.46
Thought Disorder	0.18	0.47	0.20	0.61
Attention Problems	1.58	1.85	1.45	1.86
Delinquent Behavior	0.67	1.06	0.71	1.03
Aggression	3.21	2.92	3.30	2.89
Externalization	4.50	4.15	4.49	4.01
Internalization	4.35	4.11	4.71	5.61
Total Problem Scores	12.63	9.74	14.12	11.46

As regards separate weight goups (normal and over), results show significant effects for Withdrawal, Somatic Complaints, Social Problems, Internalization, and Total Problem scores. The overweight group was rated as more withdrawn ($F(1, 3111)= 15.31$; $p<0.000$), and unsociable ($F(1, 3113)= 37.08$; $p<0.000$) then normal weight group. The overweight group was also rated much higher on the Somatic Complaints scale ($F(1, 3110)= 4.45$; $p<0.035$), Internalization ($F(1, 3107)= 7.86$; $p<0.005$), and Total Problem scores ($F(1, 3094,)= 19.34$; $p<0.000$). No significant Sex X BMI group interaction was found except for School achievement ($F(1,3110)= 5.40$, $p<0.020$).

It can be seen from the above results that the Withdrawal, and the Somatic Complaints, which constitute the Internalization scale indicating internal distress had significantly higher scores for the overweight group than for the normal-weight group for both sexes. As regards externalization, our results did not reveal significant difference between the two groups of children. Of the specific syndromes scales, the greatest difference between normal and overweight children was found for the Social Problems scale for both sexes. Our results confirm the well known fact about the sex differences: on the majority of CBCL scales boys scored higher than girls except for school performance.

Stigma and discrimination against obese children is evident. Our data suggest that obese boys are more likely to be teased than non-obese peers. However, this is not confirmed in the group of girls (Table 3.).

Table 3: Parent's answer to item 38 of CBCL (teased a lot) and defined weight groups by BMI at age 10

	Parent's answer to item 38 (teased a lot)							
	Boys				Girls			
BMI groups	**not true**	**somewhat true**	**very true**	**Row total**	**not true**	**somewhat true**	**very true**	**Row total**
Underweight	265	36	1	302	255	20	1	276
Normal-weight	1235	115	3	1353	1129	81	11	1221
Overweight	217	61	7	285	233	24	2	259
Column total	1217	212	11	1940	1617	125	14	1756

$\chi^2 = 63.39$, df=4, $p<0.0000$ $\chi^2 = 3.05$, df=4, $p<0.54$

We obtained further information about the child's weight status from the item No 55 of the Child Behavior Checklist (CBCL). The accuracy of the parents estimation was examined by comparing the child˘s appraised weight status with the normal-weight and overweight group definition based on the BMI. 89.6 % of the mothers had accurate estimations. Of those who were inaccurate, 66% underestimated their child`s weight status and 33.7 % of the mothers overestimated it. Mothers' accuracy in estimating child˘s weight status were near the same for both sexes. Mothers tended to underestimate more their daughter's weight status (70.8 %) than their son's (61 %). One-way ANOVAs were performed on mean of CBCL problem scales and competence scales, to determine mothers' estimation effects. We separated three groups of mothers according to the accuracy of their estimation. 3309 mothers' estimation can be considered accurate while 382 mothers judged unreliable (253 underestimate, 129 overestimate). For most of the CBCL scales and scores we found significant effects. Mothers who overestimated their children's weight also rated them significantly higher on problem scales, and lower on competence scales.

Discussion

This study indicates that emotional and social problems may be associated with children's obesity. Our data suggest that obese children are more likely to be inhibited, overcontrolled and they were rated higher on the Social Problems scale of CBCL than non-obese peers. The obtained differences between normal and overweight children suggest that emotional and behavior disturbances are more likely to be emerge as the consequences of obesity. The social prejudice and discrimination against overweight children may account for these results. The overweight boys are teased more according the mothers' estimation than their normal-weight peers, which was not present among girls. It can be seen how important the influence of parental rating and expectation is on CBCL scales and because of a possible subjective bias that was for instance present in mothers' ratings who reported overweight for their children when this was not objectively true.

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SOME CHARACTERS OF SOMATOPSYCHIC STATUS OF CHILDREN

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Abstract: *The authors summarized results of somatopsychic examination of 7 year old children (N=95) and 11 year old (91) children on the basis of follow-up study with 2 year interval. The changes of weight, height, percent body fat, total body fat, lean body mass, reaction time, attention and IQ were examined.*

The authors established, among others, girls have significant increment both in LBM (p < 0.001) and in total body fat (p < 0.05) in two examined intervals, while boys have significant increment only in LBM (p < 0.001).

The reaction time decreased significantly in two sexes (except 7-9 year old boys). However, the attention progressed significantly both in boys and girls during puberty.

The rate of boys' IQ (Raven test) increased significantly between 11-13 years of age, while girls' IQ remained unchanged.

Key words: *Longitudinal study; Body composition; Disjunctive reaction time; Attention; Intelleigence; 7-year-old, 11-year-old-children.*

Introduction

The number of investigations concerned with the relationship between the physical and mental development are relatively few in Hungary (Bodzsár 1981, Bodzsár and Pápai 1993), and in foreign countries as well (Barker 1937, Scripcaru et al. 1984. Shuttlewath 1939, Stone et al. 1955, Tanner 1966, Lindgren1979). The different results of the examinations are not entirely correspond. According to some authors there can be a parallelism between the physical and mental development, but others deny it.

In the present study we summarise the results of anthropological and neurofunctional examinations on the basis of a follow-up study with a 2-year interval during the period 1981-1983 at a primary school in an inner district of Budapest.

The purpose of this study:

to establish the sexual differences of anthropological and neurofunctional parameters

to determine the sexual difference of the rate of growth,

to determine the differences of the neurofunctional parameters of boys and girls subgrouped by the body fat percent,

to establish connections between somatic and psychic development of children.

Material and methods

We have carried out a 5 year longitudinal study of the children in primary school based on anthropological, neurofunctional, cardiorespiratoric, motor and sociologic parameters.

The sample consisted of 95 (45 boys and 50 girls) 7-year-old, and 91 (43 boys and 48 girls) 11-year-old children. Two age groups (7-9 and 11-13 years) of these children were investigated during these years.

We evaluated the changes of weight, height, and body composition (Durnın and Rahaman 1967, Siri 1956), disjunctive 4-choice reaction time, attention, and level of intelligence (Lehman 1962, Woodworth and Schlosberg 1966).

The disjunctive reaction time with disjunctive reaction time measuring equipment (in modes perception and reaction), the attention with tachistoscope, and the level of intelligence with Raven test were carried out.

As for statistical methods, comparison of various parameters was performed with Student test , and Kruskal-Wallis test, and the connection between various parameters with Kendall-Spearman correlation (Yule and Kendall 1964).

Results

Significant differences were found between the boys and girls at the ages of 7 and 9 in LBM and in body fat percent. The rate of growth - except body fat% - was significant in every anthropological parameter in both sexes. The rate of growth was significantly different between the boys and girls only in body fat%. There was more intensive increase of body fat% in boys between 7 and 9 years (Figure 1).

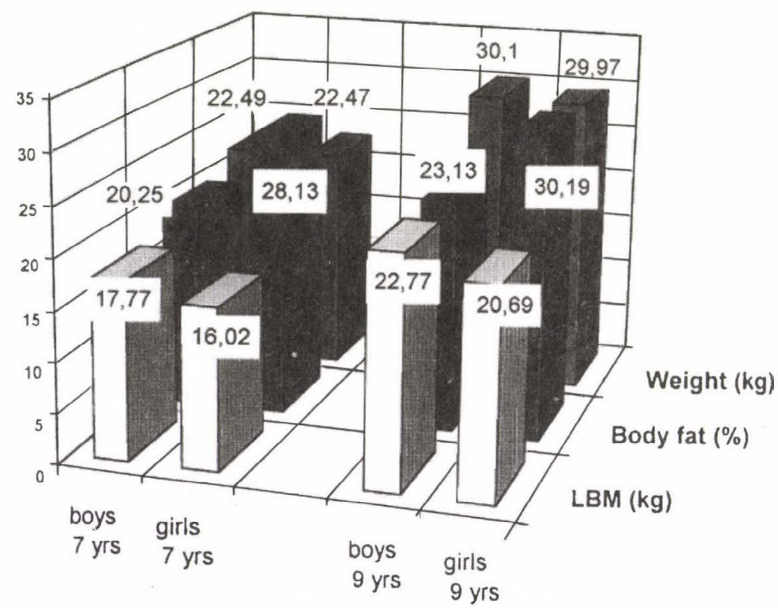

Fig. 1: Changes of some anthropological parameters between 7- 9

There were significant differences in the anthropological means of boys and girls - except the LBM- at the age of 11. These differences were maintained at the age of 13 as well. The rate of growth - except the body fat% - was significant in all anthropological parameters in both sexes (Fig. 2).

At the age of 7 the disjunctive reaction time was shorter, and the performance % of the disjunctive reaction time was better in girls, than boys. There was a significant difference between boys and girls in the intensity of reaction time shortening (Figs. 3, 4).

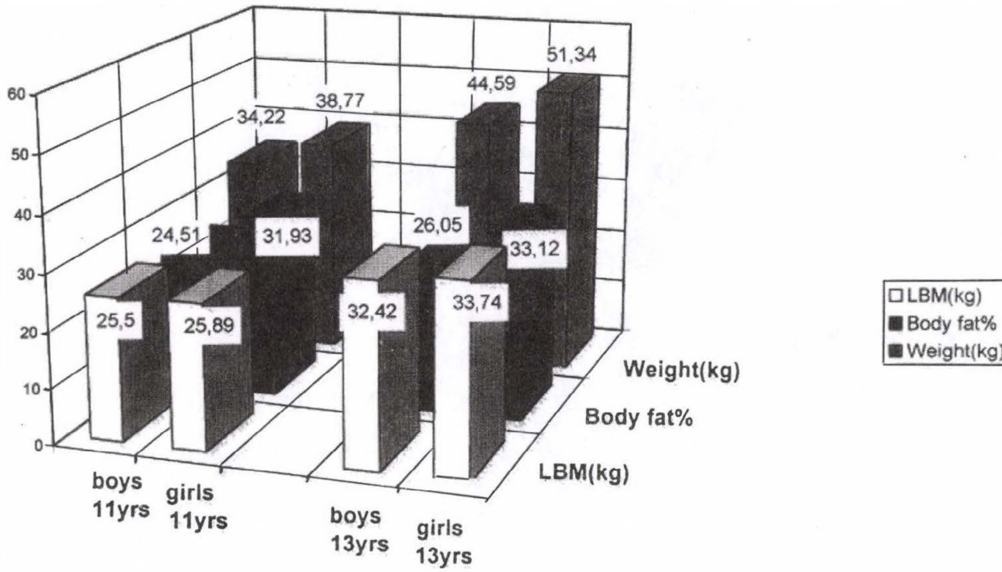

Fig. 2: Changes of some anthropological parameters between aged 11-13

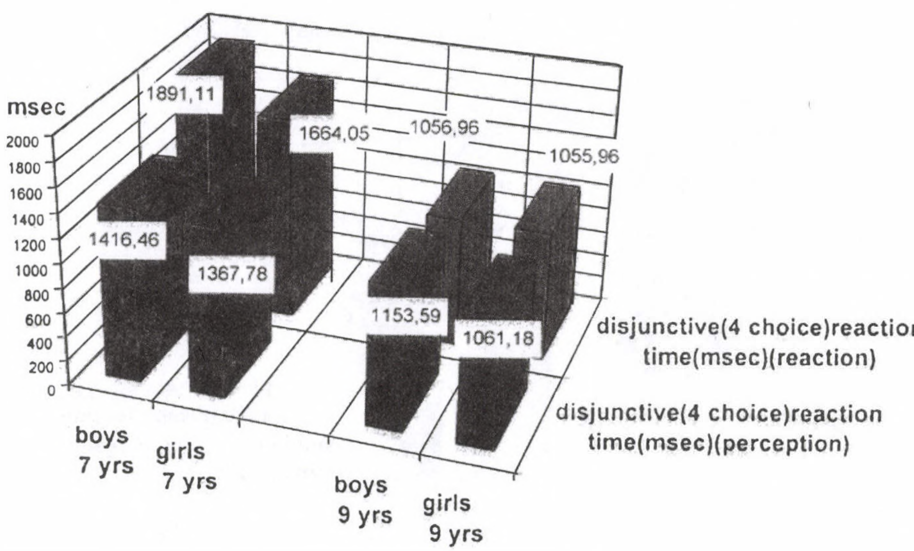

Fig. 3: Changes in disjunctive reaction time between aged 7-9

We did not find significant differences either between boys and girls of 11 or between boys and girls of 13 in neurofunctional parameters. The decrease of reaction time during the two years, and the improvement of performance % of reaction time were significant in both sexes as well (Figs. 5, 6).

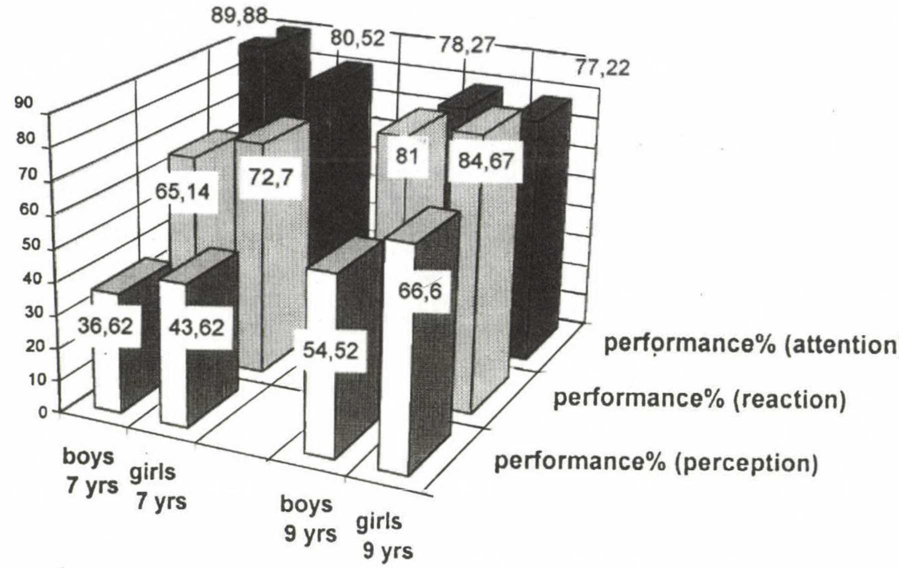

Fig. 4: Changes in the performance % of reaction time between aged 7-9

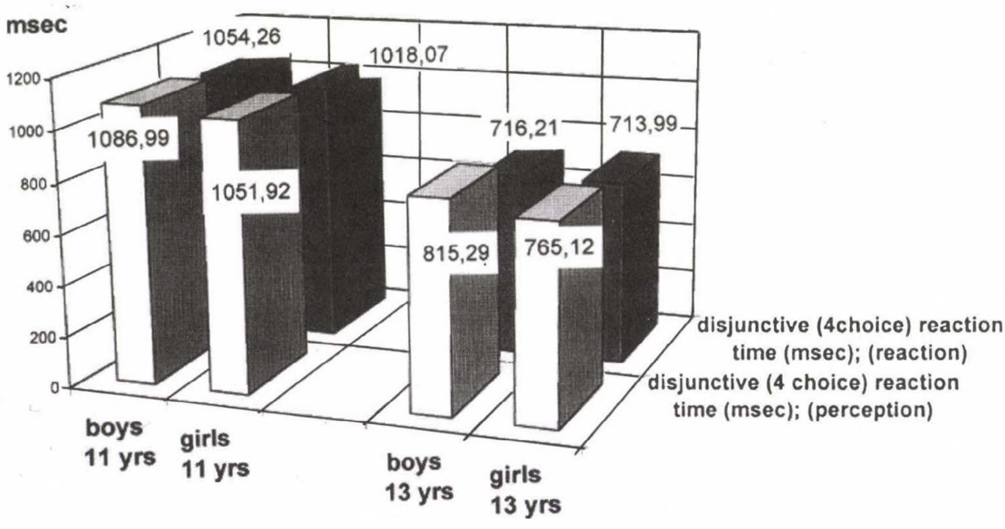

Fig. 5: Changes in disjunctive reaction time between aged 11-13

The results of the comparative investigation of neurofunctional parameters show no definite tendency. Significant differences were found in disjunctive reaction time between various body fat % groups in 11-year-old girls, and in 13-year-old boys, in percent of Raven test in 9-year- old boys, the rate of development of Raven-test in 9-year-old boys, and the performance % of attention in 13-year-old girls (Table 1).

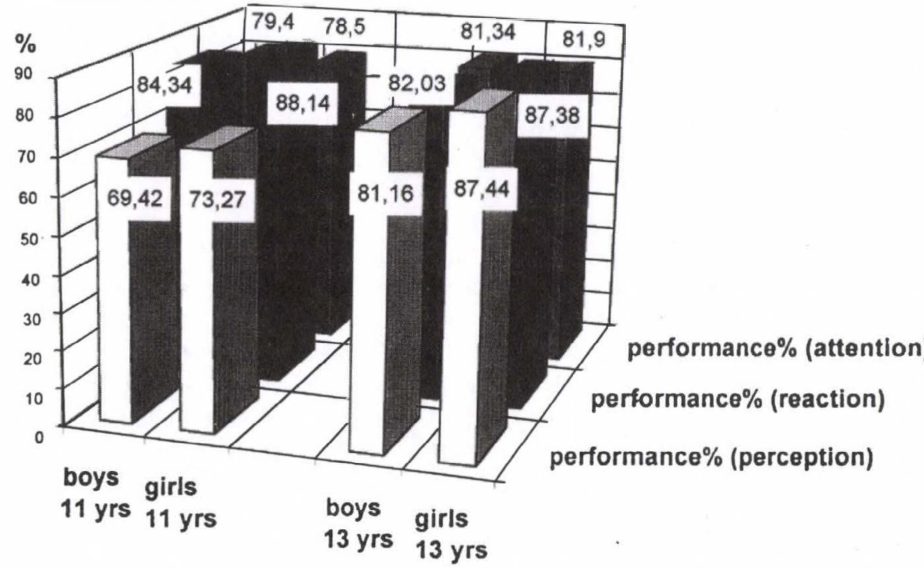

Fig. 6: Changes in the performance % of reaction time between aged 11-13

Table 1: Significant differences in some neurofunctional parameters of children' subgrouped by body fat

Neurofunctional Parameters	Age in years							
	7 yrs boys	7 yrs girls	9 yrs boys	9 yrs girls	11 yrs boys	11 yrs girls	13 yrs boys	13 yrs girls
D. Reaction Time (msec) Perception						*	*	
Performance % of D. Reaction Time						*		
Performance % of Raven Test			*					
Rate of Raven Test			*					
Performance % of Attention							*	

* $p < 0.05$

Conclusions

The difference of anthropological parameters between the boys and girls in preadolescence was significant in body fat percent and LBM, and the rate of growth in body fat percent. In adolescence, the sexual differences in anthropological parameters was significant only in body fat percent, but not in LBM.

While there were significant differences between the boys and girls in reaction time in preadolescence, there were no significant differences in adolescence. Girls had better results.

The rate of growth was not significant in body fat percent at this age.

The children were divided into 3 groups on the basis of percent of body fat.

A significant difference in reaction time have been found in children of the first and second groups (low and medium body fat%) and the second and third groups (medium and high body fat%), i.e. 11-year-old girls and 13-year-old boys, as well as in 9-year-old boys on the basis of the Raven-test.

Routine school doctor examinations, do not include the determination of body fat%, although it shows a significant connection with neurofunctional characteristics which should be optimalized for good school performance.

A statistically significant connection has been found between height and reaction time in boys at the age of 9, and between weight and attention, as well as between weight and the Raven-test result in girls of 13. Some parameters (height, weight and body fat%) of somatic development influence the development of neurofunctional parameters and this effect was different at the age of preadolescence and adolescence. Neurofunctional parameters of boys in preadolescence and boys and girls in adolescence show a significant connection with the parameters of somatic development, the increase of body development parameters is accompanied by a positive change in neurofunctional parameters. A more precise determination of this connection could be carried out if the results of our longitudinal study have been completely processed.

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Anthrop. Közl. *38;* 185–194. (1996/97)

THE PROTECTIVE EFFECTS OF FAT VS. LEAN TISSUE AND POSTMENOPAUSAL OSTEOPOROSIS

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Abstract: *Loss of bone density associated with increased risk of fractures occurs in both sexes after the age of 40 to 50 years. Because men attain a higher peak bone mass in young adulthood, they can sustain more bone loss than women before the risk of fracture becomes significant. Moreover, women experience a period of accelerated loss at and immediately following the decline in estrogen synthesis characterizing menopause. Consequently, osteoporosis is an important health problem for postmenopausal women in the United States and in other industrialized countries. Women who are excessively slender, experience late menarche, remain childless, and experience early menopause are generally at higher-than-average risk for osteoporosis. Because adipose fat tissue plays a role in converting androgenic steroids to estrogen in postmenopausal women, it has been hypothesized that obesity may lower the risk of postmenopausal osteoporosis. On the other hand, the retention of skeletal muscle mass into later life has also been associated with superior bone density and lower fracture risk. The data presented here support the contention that fat-free body mass has a greater influence on retention of bone mass than does fat-mass in postmenopausal women. Men characteristically have greater lean body mass than women from adolescence into old age. Their higher bone mass provides additional evidence of the important role played by skeletal muscle in the maintenance of bone density.*

Key words: *Postmenopausal osteoporosis; Body Mass Index, Fat Mass, Lean Tissue Mass, and bone Density Values.*

Background

The predominant causes of mortality in industrialized nations remain cardiovascular disease and cancer. Overweight has been implicated in both of these major causes of mortality. Consequently, there is widespread interest in the formulation of recommendations for desirable weight for height and age. In a summary of current opinion on healthy body weight, Meisler and St. Jeor (1996), enumerate the recommendations of the expert panel of the round table on healthy weight sponsored by the American Health Foundation. Their first recommendation is that upon the attainment of full adult growth, (around the age of 21 years), a body mass index (BMI) of less than 25 should be maintained. Second, when BMI exceeds 25, weight loss to reduce BMI by two units should be recommended. Additional weight loss should be attempted only after the new BMI level has proven sustainable for at least six months. Intrinsic in these recommendations is acknowledgment that weight loss achieved at the expense of lost skeletal muscle or bone mass does not improve an individual's overall risk profile (see also Wardlaw, 1996).

Increased fracture risk due to low bone density is known to be associated with a number of other risk factors including low body weight and BMI, Wardlaw (1996), cites the occurrence of low bone density associated with a BMI less than 22 when compared with bone densities of individuals whose BMI is greater than 28. The reasons for these associations in women, both before and after menopause may include increased estrogen production, storage, and release by adipose tissue, (Grodin, Siiteri and Macdonald, 1973; Reid, Plank and Evans 1992), as well as the mechanical effects of increased muscle mass and the stresses generated by muscle contraction (Aloia et al.; Compston et al. 1992; Harris, Dallal, and Dawson-Hughes 1992; Kroger et al. 1994; Reid, Plank and Evans 1992; Reid et al. 1992).

Thus, both fatfree and fat mass may play a role in the retention of bone density. It has been shown that on the average, BMI is affected more by fat mass than by muscle mass. This is generally true despite the fact that lean tissue has greater mass per volume than adipose fat, and that a very lean individual with substantial lean body mass will have a higher BMI than an individual of the same weight with more adipose fat (Ross et al. 1988). However, the error generated by this association is only likely to reach a significant level in athletes and others whose percent body fat is at the extreme low end of the range of variation.

The study reported here focuses on the relationships between the BMI, total body fat, fatfree mass and several blood chemistry values with bone density in postmenopausal women.

Study Population and Methods

The subjects of the present study were 129 women aged 51 to 84 years (average age 71.32 years), drawn from the participants of a wheat-bran fiber supplementation project being conducted as part of a Colon Cancer Prevention Program at the Arizona Cancer Center, (Principal Investigator, David Alberts, M.D.).

Bone density values were obtained at the distal one-third and ultradistal sites on the left radius using the Lunar Radiation SP-2 photon absorptiometer. Body composition values were obtained using bioelectric impedance to determine total body water, total fat mass, and total fatfree mass. Annual bioelectric impedance and bone density measurements are taken at the same session as the height and weight measurements used to calculate BMI. Blood samples for analysis of blood chemistry values are drawn during separate examinations. All obtained values are entered in central data files at the Biometry Division at the Arizona Cancer Center. Analysis of data for the present study was conducted at the Laboratory of Biological Anthropology using computing facilities maintained there as well as through the local area network of the Department of Anthropology. Statistical analysis using EP16 and SPSSPC+ provided the regression and correlation values reported here.

Results

Bone density values for the distal one-third site of the radius are shown in table 1. Included in table 1 are data from the Tucson-Sun City longitudinal study for males and females of the same age groups as the study sample. The sharp differences between male and female bone densities are seen consistently through all of the age groups compared here. Also of interest is the sex difference in average rate of decline in bone density characterizing these age groups when compared cross-sectionally.

While the male average declines about 4.4% between the 50-59 year and the 60-69 year categories, the female values decline 11.8% in the large study and 7,9% in the sample reported here. Male bone density declines an additional 2.2% in the next decade (70-79) and 5.9% in the 80-89 decade. Average female values decline an additional 8.6% and 8.4% respectively in the large study and in the colon cancer prevention study during the 70-79 year decade and 8.6% and 7.2% during the 80-89 year decade. The average cumulative decline in women is 26% in the large population and 22% in the colon cancer prevention study subjects.

Table 2: Arizona bone density values Sun City and Tucson 1996

Age	Sex			
	Male		Female	
	BMD	n	BMD	n
< 50	0.7703	(27)	0.6648	(276)
50 - 54	0.7598	(18)	0.6573	(111)
55 - 59	0.7437	(14)	0.6272	(113)
60 - 64	0.7426	(62)	0.5942	(280)
65 - 69	0.7311	(128)	0.5527	(585)
70 - 74	0.7163	(181)	0.5324	(663)
75 - 79	0.7166	(188)	0.4919	(557)
80 - 84	0.6778	(143)	0.4769	(390)
85 - 89	0.6475	(57)	0.4510	(189)
> 90	0.5567	(13)	0.4118	(59)
Total		**831**		**3223**

BMD = Grams of Bone mineral / square centimeter

The average cumulative decline for men is 12.3%. While these are cross sectional data, results of longitudinal comparisons confirm the sex differences in bone densities and rates of decline. When the results of males and females for whom five consecutive annual bone scans were recorded it was found that the annual rate of loss of bone mineral content and percent coritcal area, (PCA) at the distal one-third site was as follows:

AGE GROUP	60-70 YEARS		70-80 YEARS		80-90 YEARS	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
BONE MINERAL Δ	-.0058	-.0061	-.0037	-.0052	-.0071	-.0079
PCA Δ	-.6750	-.9374	-.5266	-.7367	-.7127	-.9918

Of particular interest in this comparison of male and female bone density loss is the degree to which PCA (percent cortical area, a measure of the thickness of the radial cortex), declines in females. Our longitudinal results indicate that this decline, which substantially enhances the risk of long bone fracture, is the result of both bone mineral loss and remodeling (Stini, et al., 1992).

Body Mass Index, Fat Mass, Lean Tissue Mass, and Bone Density Values

Although the mechanisms underlying these sex difference in bone remodeling are still poorly understood, an association with greater lean body mass and weight-bearing stress on bone in males up to advanced old age has the potential to produce differences of the sort seen in this sample. Table 2 provides age and sex comparisons of BMI and PCA values with increasing age in for participants in the Sun City and Tucson Longitudinal Bone Density Study.

Table 2: Percent cortical area (PCA) as related to body mass index (BMI) for Arizona males and females ages 60 to 90 years.
Percent cortical area (PCA) by age sex and body mass index (BMI)
Sun City and Tucson males and females aged 60-90 years

Site	Sun City				Tucson			
	Male		Female		Male		Female	
Age			60-70				60-70	
BMI	27.01	(54)	25.09	(150)	26.94	(76)	25.78	(356)
PCA	45	(54)	44	(150)	46	(76)	44	(356)
HPCA*	46	(16)	45	(34)	49	(24)	46	(100)
LPCA**	43	(1)	40	(10)	41	(3)	39	(32)
Age			70-80				70-80	
BMI	25.99	(122)	24.74	(252)	25.87	(145)	25.70	(468)
PCA	46	(122)	40	(252)	45	(145)	40	(468)
HPC*	46	(33)	41	(51)	46	(45)	41	(117)
LPCA**	45	(3)	37	(29)	43	(7)	37	(34)
Age			80-90				80-90	
BMI	25.14	(54)	23.73	(81)	24.55	(66)	24.53	(251)
PCA	43	(54)	37	(81)	42	(66)	36	(251)
HPCA*	43	(11)	39	(10)	42	(5)	39	(41)
LPCA**	27	(1)	35	(14)	32	(3)	33	(29)

* HPCA = PCA for subjects whose BMI is > 28

** LPCA = PCA for subjects whose BMI is < 20

In can be seen in table 2 that BMI declines with age in both sexes along with PCA. However, the decline in PCA is greatest where BMI is lowest, and male PCA exceeds female PCA at all represented ages. Table 3 shows the relationships of both PCA and BMI to the ratio of current bone density to peak bone density, (a normative value representing maximum bone density attained in young adulthood, designated "percent young normal", and abbreviated to PCTY). Table 3 also shows the relationship of age and sex-matched values, (PTA), to PCA, BMI, and PCTY.

From the foregoing, it is clearly evident that there is an association between the components of BMI and bone density. However, since BMI reflects both fat-free and fat mass, it is of interest to examine the relationships between these compartments and bone density values. Table 4 shows the correlations between fat-free body mass and other body mass and bone density values obtained from a sample of 146 males and 71 females aged 60 to 84 years. In addition to the bone density values taken at the distal 1/3 site of the radius, this table includes ultradistal radius values. The ultradistal site differs from the distal 1/3 site in containing upwards of 80% trabecular bone in contrast to the preponderance of cortical bone characterizing the distal 1/3 site. While the correlations shown in table 4 are all significant at the ($p<.01$) level, the correlations for females are consistently higher.

Table 3: Percent cortical area at the distal one-third radius site as related to body mass index (BMI) in Arizona populations of both sexes.
Bone cross-sectional characteristics as related to body mass index

Sample	Body Mass Index			
	< 20	20-25	25-28	>28
Tucson women				
Cortex	0.68	0.81	0.91	0.93
Medullary cavity	1.03	1.02	1.00	0,99
Percent cortical area	39.80	44.00	47.60	48.40
Sun City women				
Cortex	0.77	0.88	0.91	0.99
Medullary cavity	1.02	0,97	1.05	0.93
Percent cortical area	43.00	47.60	46.40	51.60
Tucson men				
Cortex	0.94	1,00	1.01	1.00
Medullary cavity	1.41	1.38	1.17	1.25
Percent cortical area	40.00	42.00	46.30	44.40
Sun City men				
Cortex	1.00	1.00	1.00	1.00
Medullary cavity	1.00	1.17	1.17	1.34
Percent cortical area	50.00	46.00	46.00	42.70

Table 4: Correlations of fatfree body mass and other body mass and bone density values: sexes compared*

Value	Correlation with fatfree mass males (n=146)	Correlation with fatfree mass females (n=71)
Body Mass Index	.657	.662
Total Body Fat	.587	.656
Age	-.400	-.374
Distal 1/3 BMC	.491	.711
Ultradistal BMC	.409	.557
Distal 1/3 density	.352	.512
Ultradistal density	.292	.480
% Age & sex matched*	.235	.401
% Peak bone density**	.282	.498

* Average age of males and females = 71.8 years

** Average of density at both distal 1/3 and ultradistal sites

Note: all correlations significant at $p < .001$

When the correlations of fat-free body mass with other BMI components and with bone density for all postmenopausal women in the Wheat-fiber study are examined in table 5, it can be seen that all correlations are highly significant. As in table 4, correlations with the density values taken at the distal 1/3 site, where cortical bone predominates, are higher than those taken at the ultradistal site which is predominantly composed of trabecular bone.

Table 5: Correlations of fatfree body mass with bone density values for postmenopausal women (n=125)

Variable	Correlation
Body Mass Index	.6556*
Weight	.8264*
Fatmass	.6672*
Distal 1/3 radius density	.4602*
Ultradistal radius density	.4084*
% Peak distal 1/3 density	.4604*
% Peak ultradistal density	.4045*
% Age-matched distal 1/3 density	.3515*
% Age-matched ultradistal density	.3196*

* 1-tailed significance <.001

Blood Chemistry Values

Table 7 shows the values for a number of bone density, body composition and blood chemistry variables for postmenopausal women of low (<22) and high (>28) BMI. The expected strong relationship of BMI with both fatfree mass and total body fat is clearly evident when the high BMI women are compared to the low BMI as does serum creatinine, triglyceride, glucose, urea nitrogen and iron levels.

Table 6: Correlations of total body fat with bone density values for postmenopausal women (n=125)

Variable	Correlation
Body Mass Index	.9324*
Weight	.9586*
Fatfree body mass	.6591*
Distal 1/3 radius density	.0443
Ultradistal radius density	.1833
% Peak distal 1/3 density	.0471
% Peak ultradistal density	.1818
% Age-matched 1/3 density	.0066
% Age-matched ultradistal density	.1619

* 1-tailed significance <.001

Table 7: Comparisons of bone density body composition, and blood chemistry values for postmenopausal women with Body Mass Index less than 22 and more than 28

Variable	BMI < 22 (26)	BMI > 28 (36)
Fatfree mass	75.37	97.58
Total body water	62.96	83.99
Fatmass	39.36	94.86
Distal 1/3 radius density	.5110	.5811
Ultradistal radius density	.2123	.2671
% Peak distal 1/3 density	71.85	81.80
% Peak ultradistal density	63.73	76.15
% Age-matched 1/3 density	90.92	99.10
% Age-matched ultradistal density	80.69	96.74
% Cortical area distal 1/3	49.57	49.89
Cortial area ultradistal	6.08	7.56
Serum creatinine	.9385	.9850
Serum triglycerides	118.50	214.80
Serum glucose	91.86	123.40
Serum urea nitrogen	13.91	16.68
Serum iron	86.36	96.00

Discussion

The data reported in the preceding results provide a useful basis from which to address the question of which soft tissue values bear the closest relationship to bone density values during aging. A general decrease in lean body mass appears to be a part of the aging process. This decrease is reflected in a reduction in energy requirements although not necessarily in proportion to requirements for all nutrients, (Stini, 1993, 1995). Moreover, reduction in lean body mass includes loss of both skeletal muscle, which has stringent requirements for both energy and amino acids, and loss of bone, which shares the need for amino acids to sustain collagen synthesis but also requires substantial amounts of calcium and phosphorus to maintain the balance of bone mineral turnover. Loss of bone mass, particularly in the more-dense cortical compartment has the potential to affect measures of body composition to a greater extent than is usually acknowledged.

The increased BMI values which usually occur with increasing age therefore reflect the acquisition of more body fat than simple serial comparisons of BMI would indicate. In healthy, normal females, fat mass increases while muscle and bone mass decrease after menopause (Cohn et al. 1976; Evans 1992; Wang et al. 1994). However, overall body weight is positively related to bone mass and its retention over time. (Aloia et al. 1991; Liel et al. 1988; Ribot et al. 1988; Bevier et al. 1988; Pocock, Eisman and Gwinn 1989; De Simone et al. 1989). This relationship is thought to be the consequence of mechanical forces associated with weight-bearing and other stresses related to muscular activity. (Smith and Gilligan 1989; Slemenda 1995)

Both body fat mass and fatfree mass have been shown to be positively correlated with bone mass by a number of investigators, (Aloia et. al. 1995; Bevier et al. 1988; Compston et al. 1992; Reid, Plank and Evans 1992; Reid et al. 1992; Reid et al. 1995). Some investigators suggest that fat mass is a better predictor of bone mass than fatfree mass, (Reid, Plank and Evans 1992; Reid et al. 1992; Compston et al. 1992). However, in a more recent study, Reid et al. (1995), report higher correlations of fatfree mass with bone mass in postmenopausal women, with the correlation being higher in women who regularly exercise.

Similarly, Aloia et al. (1995) found a stronger relationship between fatfree mass and bone mass than between fatmass and bone mass in both pre- and post-menopausal women, although the relationship between fatmass and bone mass became stronger after menopause. The stronger association of fatmass with bone mass after menopause may derive from the role that adipose fat plays in the conversion of androgen to estrogen, a role of increased significance to bone metabolism after menopause. The results reported here suggest that despite the important endocrinological role of fat in postmenopausal life, fatfree body mass continues to be superior to fatmass as a predictor of bone mass.

The values for PCA, (percent cortical area), in table 2 show the relationship between BMI and cortical bone density in both sexes in age groups from 60 to 90 years. While there is a progressive decrease in average BMI in both sexes, the reduction in average PCA is most notable in women in both the Sun City and Tucson samples. The difference between women whose BMI was less than 20 and those whose BMI was greater than 28 is especially notable in all age groups. The strong positive relationship between BMI and PCA reflects bone density loss of greater magnitude in women with lower BMI along with enhanced remodeling producing a thinner cortex and higher risk of Fracture.

The relationship between loss of bone, reduced PCA and BMI is further explored in table 3 where the proportion of age- and sex-matched standards for bone density are compared for both men and women from the ages of 50 to 94 years. Peak BMI is attained by both sexes between the ages of 50 and 59 with a steady decline thereafter. Some caution is advised in interpreting BMI values in these age groups because of the loss of stature, which averages 0.41 cm/year in women and 0.50 cm/year in men. These estimates are based on serial measurements taken on at least 5 occasions and as many as 13 for 842 women and 364 women between 1982 and 1995.

The comparisons of correlations of fatfree mass with BMI, total body fat, age and several measures of bone density in table 4 highlight the close relationship between lean tissue mass and bone mass and density. The correlations are in all instances higher in women than in men in this subsample of subjects participating in the wheat bran fiber project, but they are all highly significant, ($p<.001$). Table 5 lists the correlations of fatfree mass with bone density values for a sample of 125 postmenopausal women and table 6 lists the correlations of total body fat with the same values. Comparison of the values in these two tables shows the greater influence of total body fat on both weight and BMI when compared to fatfree mass in postmenopausal women. However, while fatfree mass is highly correlated with all bone density values, total body fat yielded no significant correlations.

It is of interest that, although none of the bone density values reported here are significantly correlated with total body fat, the highest correlations were with densities measured at the ultradistal site, an area of the radius where trabecular bone predominates whereas cortical bone is predominant at the distal one-third site. At the latter site, correlations of fatfree mass with bone density are higher. These relationships would suggest that cortical bone density is more influenced by muscle mass than trabecular bone is in later life, although this may not be the case during growth and young adulthood.

The comparisons of averages for body composition compartments, bone densities, and serum creatinine, triglyceride, glucose, urea nitrogen and iron for subjects with BMI values less than 22 and those with BMI values greater than 28 reveal that with the exception of PCA at the distal one-third site, higher BMI values are consistently associated with higher bone densities and blood chemistry values. The exception of the distal one-third PCA value, which is virtually identical in both high and low BMI samples may derive from the degree of remodeling experienced by the heavier women whose radial diameters exceed those of the more-slender women and for whom the additional cross-sectional area of the bone at this site may still reflect an earlier response to greater torsional stress, (Lazenby, 1990a, b; Stini et al. 1992).

Summary

Concerns for the risk factors associated with overweight have led to increased attention to the need for lifelong attention to weight control. The resultant widespread concern has undoubtedly had beneficial effects, among which may be included the reduction of the mortality rate for cardiovascular disease in recent years. It may also have helped to moderate the increases in moralities due to cancer, diabetes and certain related conditions. However, recommendations concerning what is a healthy body weight must take factors such as the relationship between body weight and bone density into consideration. This is particularly important in the population of postmenopausal women where the risk of bone fractures associated with low bone density is highest. The factors associated with low bone density in this population include low weight, and especially, low fatfree mass. It has become increasingly realized that weight loss resulting in reduced lean body mass has little to recommend it. While loss of fat may affect bone density in postmenopausal women, largely due to its potential to reduce conversion of androgens to estrogen, the risk engendered by loss of lean tissue appears to be much higher.

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Anthrop. Közl. *38;* 195-200. (1996/97)

SPORTS ACTIVITY AND BODY COMPOSITION IN HUNGARY

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Abstract: *Bioelectrical impedance analysis is based on the electrical properties of biological tissues in that lean tissue contains large amounts of water and electrolytes and is highly conductive; fat and bones are poor of liquids and therefore are poor conductors (Lukaski 1987, Baumgartner et al. 1990). In two samples of sports students of both sexes from Hungary (Budapest and Szeged), physique was assessed by height, weight and body mass index, and body composition represented by resistance, reactance and phase angle was assessed by bioelectrical impedance analysis (BIA 109/S). From these measurements mean specific resistivity, fat mass and fat-free mass were calculated. The results obtained show significant differences between the two sexes in general. Differences between the two series as with stature in males probably reflect both socioeconomic and population specific effects. There is however no difference in hydration between sports students from Budapest and Szeged as indicated by similar values of mean specific resistivity within each sex. The metabolically active amount of cells as represented by reactance is also very similar, and may be interpretated to reflect the beneficial effects of sports activity on physique and body morphology.*

Key words: *Body Composition; Bioelectrical Impedance Analysis; Sports students.*

Introduction

Bioelectrical impedance analysis is based on the electrical properties of biological tissues in that lean tissue (fat-free mass) contains large amounts of water and electrolytes and is highly conductive. Fat (fat mass) and bones are poor of liquids and therefore are poor conductors and show mean specific resistivity in excess of 1000 Ohm/cm, in comparison to fat-free tissues, which have mean specific resistivity about 140 Ohm/cm. This method has become an important technique in the assessment of body compartments in that it has many advantages over others e.g. it does not bother the subject measured, is not invasive, safe, rapid, easy to perform, reproducible and requires minimal operator training.

There is an increasing amount of data on such constituent variables of body composition which estimate major components (water, fat-free mass, fat) for healthy individuals of various origin, and also for pathological conditions. However little is known on the effect of regular sports activity for young healthy adults.

The object of this study is therefore to enquire if and to what extent differences in body composition are observed between sports students of two cities in Hungary i.e. Budapest and Szeged. Budapest is the capital and collects students from all parts of Hungary while the province capital Szeged, located in the Hungarian Great Plain near the south east border mainly collects students from neighboring rural areas. Comparability of the results is by the use of the same methods and apparatus.

Material and Methods

The series studied consist of healthy young sports students from two Hungarian cities (50 males and 51 females from Budapest; 48 males and 41 females from Szeged) ranging in age between 18 and 27 years, who performed a regime of sporting activities of at least four hours a day. The subjects were volunteers from classes at the two Universities.

Body composition was measured using the BIA 109/S impedance analyzer (Akern/RJL Systems). This apparatus generates a constant excitation current at 800 μA at a signal frequency of 50 kHz with a four electrode arrangement. Great care was taken to ensure reliability of the technique by strict discipline with the subjects and by marking the electrode sites. The measurements were carried out on the left side of the body with the subjects supine on a large table when a minimum of four hours had passed after their last meal and at least 12 hours after physical training. Anthropological variables included were stature (measured with an anthropometer) and weight (measured with a calibrated scale), and body mass index (BMI). Bioelectrically determined variables were, the relation of fat-free mass to fat mass (FFM/FM), mean specific resistivity (Rho) corresponding to resistance standardized for height, reactance (Xc) and phase angle (PA). Statistical computation besides the standard procedures includes the non parametric Mann Whitney test. For testing independence of height on age a simple linear regression was applied. For this procedure a binary variable was used for Budapest versus Szeged as the independent variable and height as the dependent.

Results

Within cities variation: Within series variation relates to differences between males and females.There are highly significant and consistent sex differences in both cities in that higher values are observed in males for stature, weight, and body mass index, and with bioelectrical variables for phase angle and the ratio of fat-free mass to fat mass (Table 1). Females on the other hand show significantly higher values for reactance and mean specific resistivity.

Between cities variation: The most conspicuous and significant differences between the Budapest and Szeged sports student are observed for males. Though higher values for reactance and phase angle are observed in both Budapest series these are only significant for males ($p < 0.01$). There is also a tendency for greater height in Budapest males. Though less marked but also significant ($p < 0.05$) differences are observed between the females in that the Szeged females show significantly higher bioelectrical values for fat-free mass/fat mass ratio than the Budapest females (Figure 1). This finding corresponds to the anthropological figures in that Budapest females are slightly heavier, a tendency also visible by somewhat greater values of mean and median of BMI. In both sexes the range of the distributions of the variables of Szeged sports students is somewhat smaller with a tendency for a shift to lower values (Figure 1).

Discussion

As was to expect, the fact that "women contain less water than men of similar weight because women have a higher ratio of adipose tissue to lean body mass" (Greenleaf 1992,

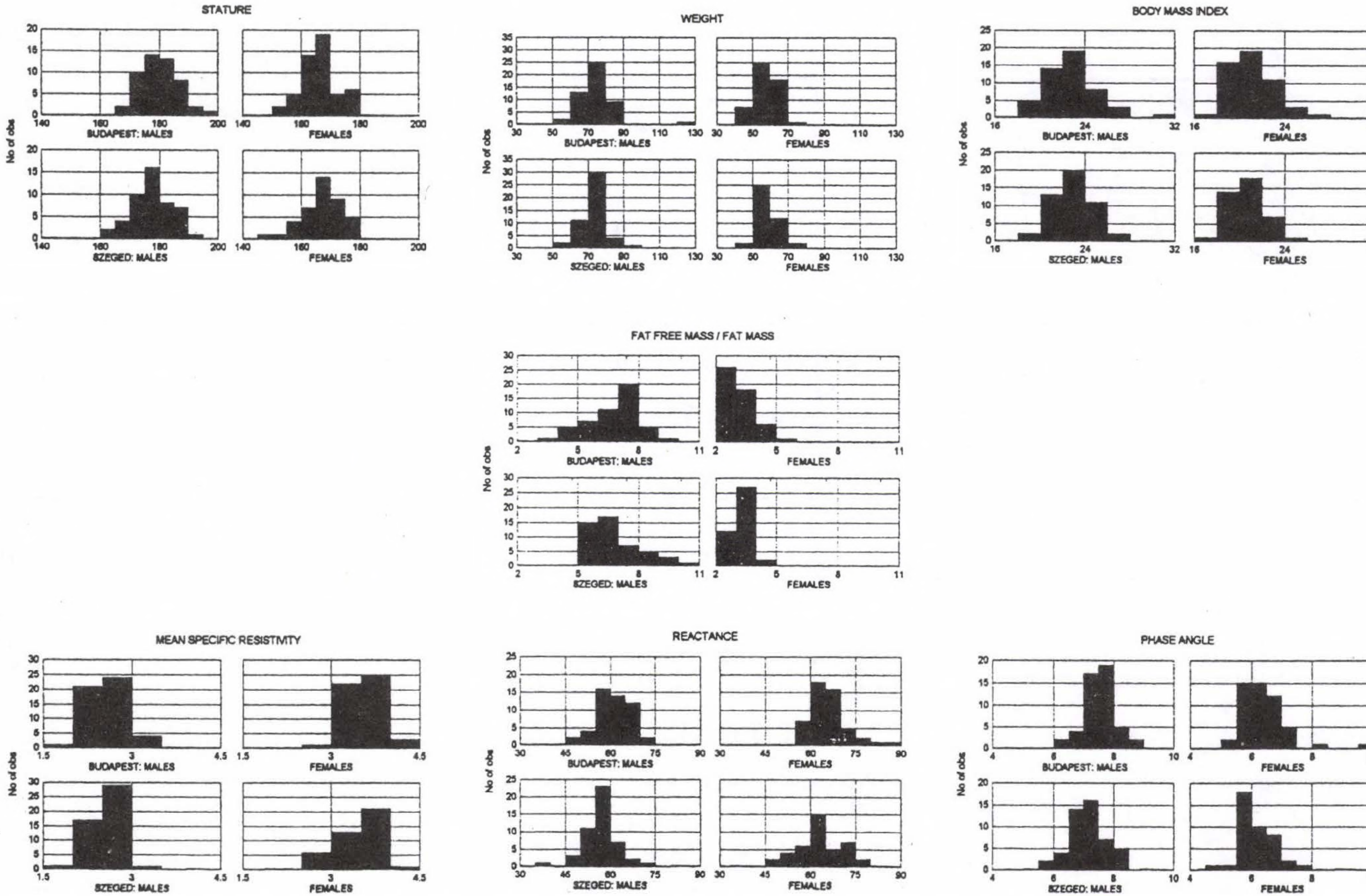

Fig. 1: Physique and bioelectrical impedance variables distributions in the Hungarian sports students by sample and sex

Table 1: Sample sizes, physique and bioelectrical impedance results in the four subsamples of sports students in Hungary

	MALES													
	Budapest							Szeged						
	N	Mean	Median	SD	Min	Max	Range	N	Mean	Median	SD	Min	Max	Range
Stature	50	179.8	179.0	6.5	166.8	197.7	30.9	48	177.4	177.4	6.6	162.4	191.9	29.5
Weight	50	73.9	72.1	10.3	58.6	122.5	63.9	48	72.3	72.0	7.3	55.0	98.5	43.5
Body mass index	50	22.8	22.3	2.3	18.1	31.3	13.3	48	23.0	22.9	1.7	18.2	27.9	9.7
Mean specific resistivity	50	2.5	2.5	0.3	1.8	3.2	1.3	48	2.6	2.5	0.2	1.9	3.5	1.6
Reactance	50	61	60	5.8	46	74	28	48	56	58	5.4	39	70	31
Phase angle	50	7.5	7.5	0.7	6.0	10.3	4.3	48	7.1	7.1	0.6	5.6	8.4	2.8
Fat free mass / Fat mass	50	6.7	7.0	1.3	3.4	9.7	6.3	48	6.7	6.4	1.3	5.0	10.1	5.1

	FEMALES													
	Budapest							Szeged						
	N	Mean	Median	SD	Min	Max	Range	N	Mean	Median	SD	Min	Max	Range
Stature	51	166.1	165.8	6.0	150.8	178.0	27.2	41	167.3	167.8	6.9	149.0	179.8	30.8
Weight	51	58.1	57.8	6.4	47.6	75.1	27.5	41	57.8	57.0	6.3	43.0	76.0	33.0
Body mass index	51	21.0	20.7	1.8	17.9	26.6	8.7	41	20.6	20.3	1.6	17.6	25.2	7.6
Mean specific resistivity	51	3.5	3.5	0.3	3.0	4.3	1.4	41	3.5	3.5	0.3	2.7	4.2	1.5
Reactance	51	66	65	6.9	57	92	35	41	63	62	7.2	47	76	29
Phase angle	51	6.4	6.3	0.8	5.3	9.6	4.3	41	6.1	6.0	0.6	4.6	7.8	3.2
Fat free mass / Fat mass	51	3.1	2.9	0.7	2.2	5.6	3.4	41	3.3	3.3	0.5	2.4	4.4	2.0

Biasioli and Talluri 1995) also relates to people who regularly perform sports, as visible from consistent sex differences in Budapest and Szeged for the variables studied. The greater body height in male Budapest students compared to the Szeged ones coincides with the findings reported by Gyenis et al. (1989) for 23 to 59 years old bus drivers. However also a socioeconomic effect cannot be excluded in that Gyenis (1985) reported a tendency for greater stature and weight in sons of non manual workers with high level of schooling. When compared to earlier studies on male Budapest sports students, mean stature of our male Budapest sample clearly reflects a still ongoing effect of secular trend when compared to that of male sports students measured in Budapest in 1985 and 1987 (Mészáros et al. 1989/90), i.e. in 1985: mean stature was 177.6, SD 6.6; in 1987: 178.5, SD 6.9; and in the present study in 1994: 179.8, SD 6.5). In view of these findings our series were also tested for a possible influence of their age distribution on height, but for none of them any effect of age on height was evident (males $p = 0.08$, females $p = 0.38$).

The consistently higher values of height, weight, body mass index, phase angle and the ratio of fat free mass to fat mass for males in comparison to females are expressions of greater robusticity and muscularity. The higher values of mean specific resistivity and reactance on the other hand in females are consistent with their higher content of fat mass. These findings are in accordance with observations on samples of sports and medicine students from Vienna (Austria) and Wroclaw (Poland) of similar ages (Hauser et al. 1996), and of a sample drawn from the population healthy of Italian adults of the same age (Biasioli and Talluri 1995).

Explanation of the differences observed for the bioelectrical variables reactance and phase angle between the sports students from Budapest and Szeged, especially marked in males would point towards a greater response of muscular tissue to sports activities in the Budapest series. Though more marked in the Budapest males the sports students in the Hungarian capital altogether appear more robust, a little fatter but also more muscular. It seems that overall the Szeged sports students similar to the Wroclaw sports students with their slightly smaller body weight and lower FFM/FM ratio in comparison to those from Budapest and from Vienna respectively may either vary with respect to nutrition, or the regime of athletic activity is less demanding in a small town than in the capital of a country, or as a further possibility the difference might be due to a different genetic composition (Roberts 1985).

Acknowledgement:This research is supported by a grant from the Jubiläumsfond of the Austrian National Bank.

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Anthrop. Közl. *38;* 201-206. (1996/97)

HEALTH STATUS AND DEVELOPMENT PATTERN IN MOROCCAN CHILDREN

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Abstract: *In reproductive life histories collected in 1984 in Morocco, procreation and child's health and development appeared to be still influenced by tradition. In the rural areas of the province of Marrakesh, the total fertility rate exceeded 8 live births, though scarcely 5 offspring survived to sexual maturity. The reproductive success varied according to the economic status, the poorest being defavorised. In spite of good starting conditions, infantile growth happened to be slowed down from the 4-5th months and onward, as a probable result of dietary inadequacy and morbidity.*

Key words: *Health status; Development pattern; Morocco.*

Introduction

The trend of modernisation which is affirmed in the main urban centres of Morocco, contrasts with the traditions of a millenary society, remained lively in many rural places. Regarding procreation and child rearing, the traditional views are those of a natural fertility. Marriage follows nubility, with the purpose of securing a progeny, with an affirmed preference for male descent. The first pregnancy usually comes short after the wedding and repeated reproductive episodes follow until advanced reproductive age. The termination of fertility being either biological or the effect of a stopping behavior (Varea et al. 1995).

Pregnancy does not withdraw the woman from domestic or agricultural activities, nor is it associated with particular health care. Confinement takes places in the familial stead, with the assistance of the mother or that of traditional midwives. From birth to the end of the 40th day, the newborn remains hidden in his mother's room (Hilali 1985). Mothers breastfeed during 18 months and sometimes more. Complementary food is given from 4-5 months of age (soups of cereals, suckers of bread soaked in olive oil and coated with sugar or honey and later on vegetables and cooked cereals). Many times, eggs and meat are postponed until the child gets his four incisive teeth (Belkeziz 1989). This period is associated with gastro-intestinal infections inducing a spurt to the infantile mortality curves around the age of six months (Baudot & Bley 1990).

Weaning is sudden and most of the time the child enters at once in the meagre adult diet based on cereals (bread of wheat or rye) with some vegetables and sparse animal contribution, giving the start to a period of weakness during which rise once again the mean levels of morbidity and mortality.

As observed in many other societies (Harpending & Draper 1987), there is therefore a contrast between the extreme care and protection offered to the infant and the following socialisation of the toddler, whose mother's attention may often be relayed by the unskilled care of an elder sister. The coming of a new sib is indeed the reason for this change.

The following study ambitions to summarize the main characteristics of fertility by analyzing data collected in 1984 in the rural province of Marrakesh (Crognier et al. 1992, 1993) and to give a brief sketch of infantile growth through cohort and transversal studies.

The reproductive pattern

The observations considered refer to 517 agriculturist women aged 50 to 70 years old, whose fertile life histories were essentially displayed in a still traditional context.

The recollected age at menarche indicates a rather late puberty (Table 1), followed by marriage within a mean interval of three years. The first conception occurs after a mean 10 months interval. Then subsequent live births are separated by a mean 3 years interval, until the last which comes at a mean age of 40.3 years. The total fertility rate is impressive with a mean number of live births above eight. However, the levels of offspring's mortality match these fertility scores and less than 5 offsprings reach their 15th birthday.

Table 1: Main characteristics of female reproductive life (N = 517)

variable	$\bar{x}$	$s_{\bar{x}}$
$\bar{x}$ age at menarche (yrs)	14.7	1.10
$\bar{x}$ age at marriage (yrs)	17.8	1.18
$\bar{x}$ interval menarche-marriage (yrs)	3.23	3.25
$\bar{x}$ interval marriage-last birth (yrs)	20.1	8.81
$\bar{x}$ waiting time to 1st birth. (mths)	19.2	1.75
$\bar{x}$ interval between births (mths)	36.7	19.0
$\bar{x}$ age at last birth (yrs)	40.3	5.37
$\bar{x}$ age at menopause (yrs)	47.0	5.28
$\bar{x}$ interval last birth-menopause (yrs)	11.7	8.11
$\bar{x}$ number live births (*)	8.20	3.29
$\bar{x}$ numbef of offsprings surviv. to 15y	4.92	2.23

* childless women excluded

The influence of economic status

The Table 2 shows the chronology of women's reproductive life according to four economic strata (agricultural workers, small farms, wealthier traditional farms and "modern" farms). An earlier termination of reproduction in the poorest group is observed, as well as a shorter span of reproductive life estimated by the interval between marriage and last birth. Hence the smaller number of live births and of offspring reaching reproductive maturity.

Chidless women are ten times more frequent in the poorest stratum than in the urbanised one (the wealthiest men could not hesitate to divorce if their wife remains sterile). Widowing also is more than twice higher in the poorest group than in the others. It affects indeed the effective marital span in reducing the exposition to the risk of pregnancy.

Environmental conditions and early infant growth

A general idea of early growth pattern in Morocco is available from a transversal study sampled in several rural and urban areas of the province of Marrakesh (Amor 1989) and through the longitudinal study of a cohort of newborn of low and middle social classes,

Table 2: Chronology and characteristics of women's reproductive life according to economic strata [1(4 = poverty (wealth]

Variable	ECO 1 N=112	ECO 2 N=145	ECO 3 N=137	ECO 4 N=012	F P
$\overline{x}$ age at menarche (yrs)	14.8	14.8	14.7	14.8	0.42 ns
$\overline{x}$ age at marriage (yrs)	17.9	18.3	18.6	17.3	4.76***
$\overline{x}$ int. men.-mar (yrs)	2.95	3.36	3.94	2.45	4.68***
$\overline{x}$ int. mar.-last birth (yrs)	17.3	21.2	19.9	21.3	4.444***
$\overline{x}$ wait. t. 1st birth (mths)	21.1	19.3	17.4	19.4	2.10 ns
$\overline{x}$ interbirths int. (mths)	38.1	37.5	33.7	38.1	1.53 ns
$\overline{x}$ lactation extent	17.5	28.4	17.8	16.7	F=0.86 ns
$\overline{x}$ age at last birth (yrs)	35.2	39.5	38.6	38.3	8.91***
$\overline{x}$ age at menopause (yrs)	47.3	47.3	47.5	47.9	1.86 ns
$\overline{x}$ int. last b.-men. (yrs)	13.7	10.5	11.0	12.1	2.30 ns
$\overline{x}$ nb live births	6.1	7.9	8.5	8.4	12.7***
$\overline{x}$ nb offsp.>15 yrs	3.7	4.6	5.0	5.4	10.5***
Nb (%) with inf. death	53 (50)	56 (39)	44 (34)	40 (31)	Chi2 ns
nb (%) childless	11 (10)	9 (06)	4 (03)	1 (01)	Chi2 ***
nb (%) widows	48 (43)	20 (14)	19 (14)	21 (19)	Chi2 ***
$\overline{x}$ eff. marit. span	29.2	30.2	30.8	31.3	(Lsd 1-4*)

examined at monthly intervals until their first birthday, in the city of Marrakesh (Belkeziz 1989).

The Figure 1 expresses the adjusted data of the 25th, 50th and 75th percentiles of growth in body weight until the age of two years in both sexes (Amor 1989), whereas the figure 2 drawn from Belkeziz (1989), compares Moroccan data to the NCHS standards during the first year of life. The Moroccan data show higher values than observed in the NCHS sample until the 5th month and become inferior in the later period, thus contrasting the excellent conditions of initial growth allowed by generalised breast-feeding and the following period during which nutritional needs of the infant cannot be fully satisfied by maternal milk only.

Conclusion

In 1992, nearly a half of the population of Morocco was still below 15 years old, a figure resulting from the traditional conceptions of family presented in this work. Major problems of child's health go with it. They deserve much attention and call for multiple interventions among which fertility control and increased medicalisation, in particular in rural areas.

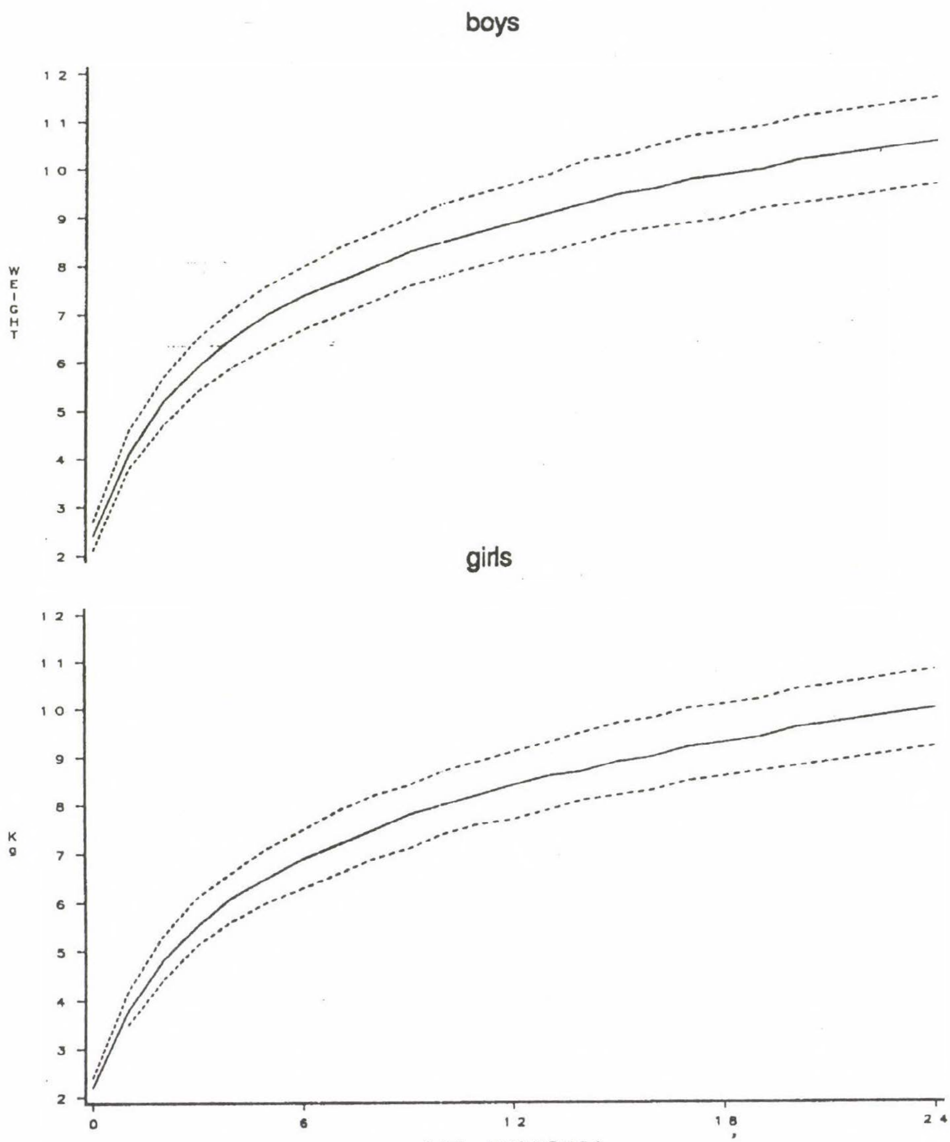

Fig. 1: 25th, 50th and 75th percentiles of weight gain from birth to 24 months in children of the province of Marrakesh (solid line 50th percentile)

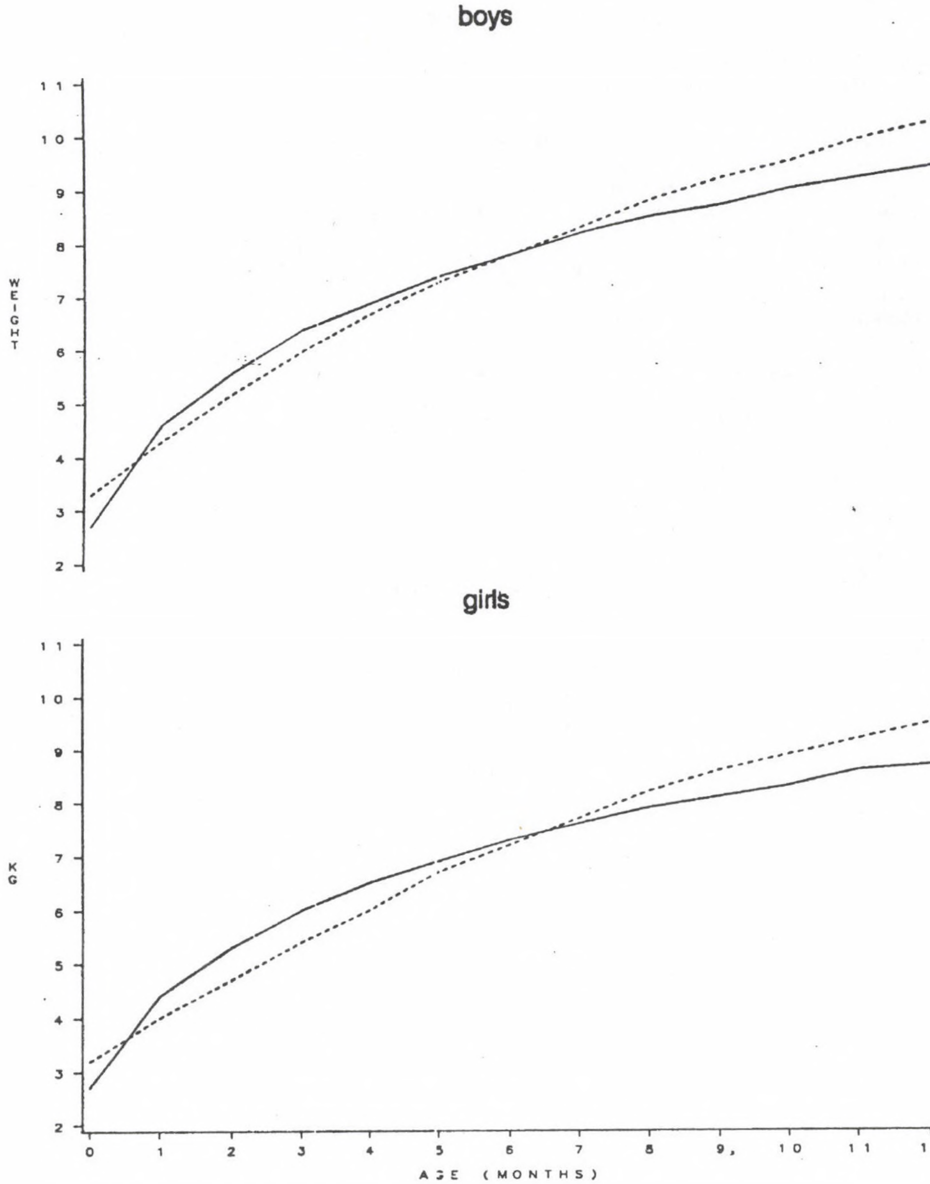

Fig. 2: 50th percentile of weight gain from birth to the end of the first year of life in children from the city of Marrakesh (dashed line), compared with the 50th percentile of NCHS study (solid line).

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Anthrop. Közl. *38;* 207–216. (1996/97)

THE SEGMOMETER: REPLACEMENT OF THE CLASSICAL ANTHROPOMETER TO OBTAIN SEGMENTAL LENGTHS

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Abstract: *A new commercially available instrument, the Rosscraft Segmometer, is proposed as a replacement for the classical anthropometer of the Martin type for obtaining segmental lengths. The evolution of the new instrument, and its design features and details of manufacturing are discussed in chronological sequence. The technical error of measurement on bilateral replicated measures involving 30 young gymnasts showed technical errors of measurement less than 1 percent that compared favorably to those obtained using the Segmometer 2 in group deployment and to those of the Segmometer 1 used to compare measures to those obtained by the classical anthropometer.*

Key words: *Anthropometry, anthropometer, instrument design, segmental lengths, segmometer, technical error of measurement.*

Introduction

Marshall McLuhan the Canadian media prophet remarked that "We observe the present through a rear-view mirror. We march backward into the future." The first automobile was simply a "horseless carriage". Perhaps because the early cars were notoriously unreliable the design was practical. The shouts of derision "get a horse" was often the expedient solution to the problem of transportation.

In the design of anthropometric instruments, the anthropometer, a device for measuring projected and derived lengths, has been virtually unchanged for 70 years. The illustration Fig. 1. shows Rudolf Martin's classical instrument (Martin, 1928). An updated instrument, with square magnesium sections and plasticized coating is still manufactured by GPM, Gneupel, Switzerland and marketed by Siber-Hegner Inc.

The senior author (WDR) was introduced to the original stainless steel anthropometer by Howard V. Meredith whom James Tanner designated as the greatest anthropometrist of his generation. Realizing that instability of the anthropometer caused untoward error, WDR designed a plastic foot-base attachment in the early 1970's that has been widely emulated.

The design faults of the classical instrument became evident from heavy student use at Simon Fraser University. The disarticulated pieces were not exactly compatible or interchangeable. The end branch and the broached plastic sliders occasionally were broken. The disarticulated end section when used as a wide sliding caliper had the tendency to bind. Pressure at the end of the long branches made this inevitable. Moreover, the use of recurved branches to obtain anterior-posterior chest breadth was never really satisfactory. The tendency to bind did not easily permit small excursions in locating the spinous process of the vertebra at the level of the mesosternale.

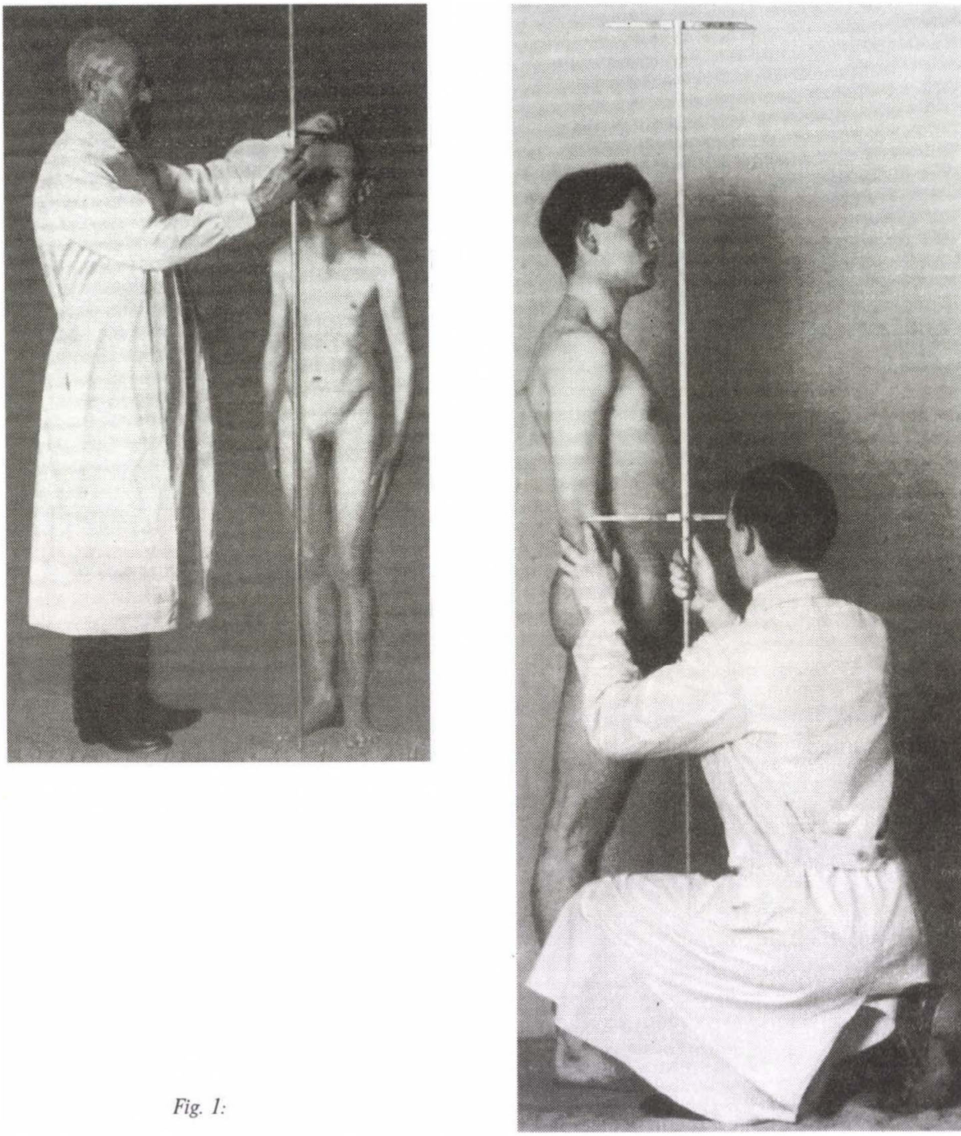

Fig. 1:

The cost of the instrument created a problem for investigators as well as for the senior author whose requests for replacement of used instruments seemed always to have a low priority in the Department of Kinesiology. Necessity, being the mother of invention, resulted in the design of a new anthropometer that could be easily replicated in non-specialized machine shops (Ross, 1985).

In 1988, Linda Blade, then a graduate student was scheduled to join her husband, an agricultural scientist in Nigeria. Her intent was to initiate studies, in particular to look at proportional segmental lengths in African children to determine if systematic differences were similar to those found in comparing black and white Olympic athletes (Ross et al., 1984). We thought of using pointers affixed to a retractable carpenter's tape to measure segmental lengths. In order to demonstrate the principle, Linda used filed cotter pins. The end pointer was fixed to the stub end of the tape by 5 minute epoxy glue. Another pointer at the housing end was secured by an elastic band as shown in Fig. 2. We tested the prototype instrument and found that it was as accurate or more accurate than the classical anthropometer (Carr et al, 1993).

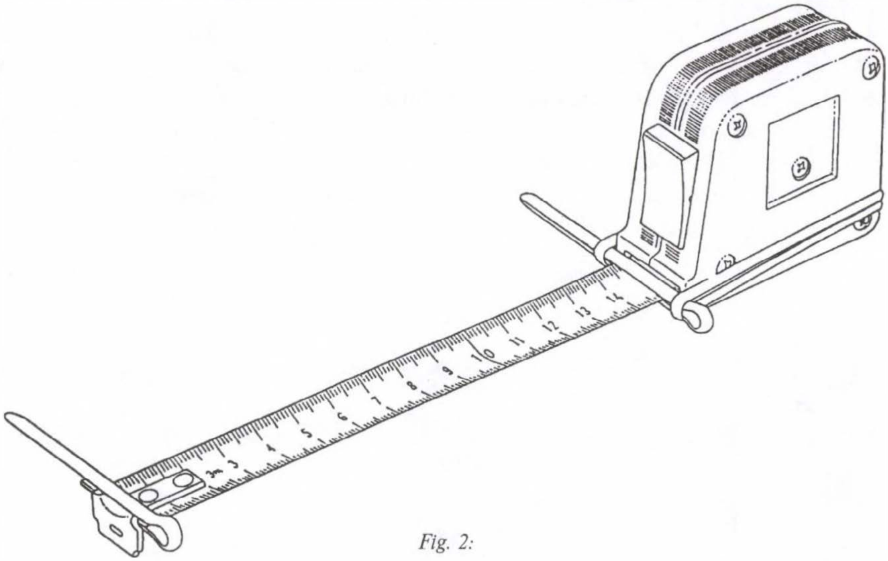

Fig. 2:

Some improvement of the design was made in the Machine Shop of the Department of Human Movement Studies of the University of Western Australia. Essentially, as shown in Fig. 3, this was to stabilize the passage of the tape in the tape housing. The new segmometers were used in Perth in 1991 in the Kinanthropometric Aquatic Sports Project (KASP) reported by Carter and Ackland (1994). The specification of techniques and obtained technical errors of measurement from replicated measurement by different measurers are included in Appendix B of the report by Ross et al. (1994).

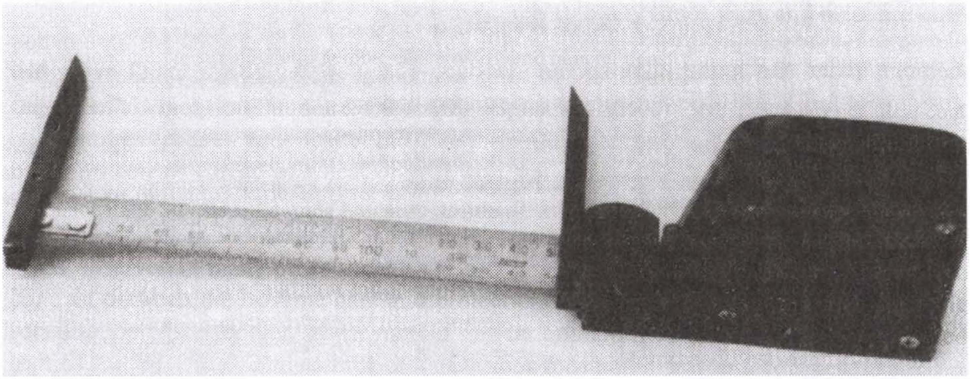

Fig. 3:

Segmometer 3

In the expansion of Rosscraft, a science and technology transfer company since 1981, the segmometer was redesigned and manufactured by T.E. and B. Ross. The new instrument, was designated as the Segmometer 3, the first being the Blade model and the second, the adapted version designed at the University of Western Australia and used in KASP.

The Segmometer 3, dispensed with the tape housing and featured machined end- and sliding-pointers as shown in Fig. 4. A blue tape at the inside edge right angles to the scale provides for measures of direct segmental lengths, and a laser engraved scratch line on the viewing glass provides for reading of projected heights. The parts are tumbled to achieve a satin finish for black anodizing. A machined track with Teflon insert and a fiber adjustment screw ensures smooth passage of the tape without lateral play. Ostensibly simple, the manufacture of the Segmometer 3 requires 13 milling, 7 drilling, 5 tapping, 2 riveting, 2 tumbling, 2 anodizing, 2 laser and 10 assembly operations on each instrument.

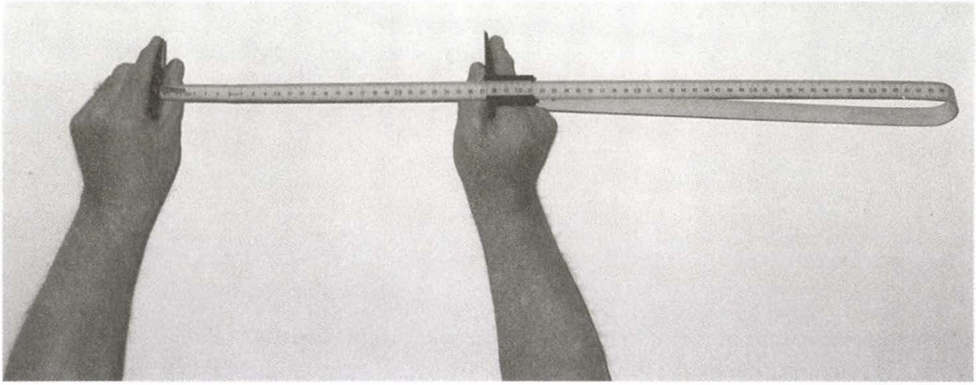

Fig. 4:

Subjects

One of the first applications of the Rosscraft Segmometer 3 was in team deployment of anthropometrists in a pilot project for a proposed longitudinal study of gymnasts at Western Washington University. Thirty young girl gymnasts were studied using single and on occasion double replicated measures bilaterally of the following segmental lengths: arm (acromiale-radiale), forearm (radiale-stylion), hand (midstylion-dactlion), thigh (trochanterion-tibiale laterale), and tibia (tibiale mediale-sphyrion tibiale).

Methods

The techniques used with the exception of ulna length were similar to those reported by Ross, et al. (1994) and Ross (1996), and those endorsed for the national standardization scheme in Australia as specified in the new textbook an Anthropometria (edited by Norton and Olds, 1995). The techniques are also specified in addenda files with the software for the O-Scale Physique Assessment System (Rosscraft course 2000 version).

Analyses

The data were analysed using the technical error of measurement (TEM) advocated by Dahlberg (1940), Johnston et al. (1972), Mueller and Martorell (1988) and Knapp (1992). Precision from replicated measures was expressed as follows: TEM = (sum d^2/2n)^.05, where (sum d^2) is the sum of the square of the differences between the first and a replicated measurement, and (n) is the number of comparisons.

Table 1 shows summary data using Segmometer 1 by Carr (1994), Segmometer 2 in the team deployment in KASP (Ross et al. 1994), and Segmometer 3 in the present study. The obtained values in KASP using the Segmometer 2, were obtained by different measurers. Although acceptable, especially in comparsion with technical errors using the classical anthropometer, they were not as precise as those obtained by Carr using the Segmometer 1. Clearly, the technical errors by Carr using Segmometer 3 defines new levels of precision attainable for segmental lengths by a single measure (Fig. 5).

Table 1: Precision summary of three segmometers

Segmental Lengths:	arm	forearm	hand	thigh	tibia
Segmometer 1					
Mean R	33.67	28.86	18.89	45.23	39.60
SD	2.80	2.53	1.57	3.67	3.34
SE	0.13	0.04	0.08	0.18	0.17
TEM	0.24	0.19	0.19	0.28	0.19
N*	165	165	165	165	165
Segmometer 2					
Mean R	33.97	25.9	19.63	44.64	38.74
SD	2.66	2.08	1.55	3.22	3.08
SE	0.31	0.24	0.18	0.36	0.35
TEM	0.28	0.35	0.24	0.40	0.20
N	76	75	75	79	79
Segmometer 3					
Mean R	26.83	20.32	15.60	36.35	32.31
SD	3.15	2.31	1.37	3.74	3.23
SE	0.41	0.30	0.18	0.48	0.42
TEM	0.09	0.09	0.10	0.12	0.06
N	30	30	30	30	30
Segmometer 3					
Mean L	26.68	20.23	15.68	36.18	32.26
SD	3.11	2.30	1.36	3.79	3.32
SE	0.40	0.30	0.18	0.49	0.43
TEM	0.13	0.09	0.10	0.12	0.10
N	30	30	30	30	30

*N = 1-2, 2-3, 1-3; other 1-2

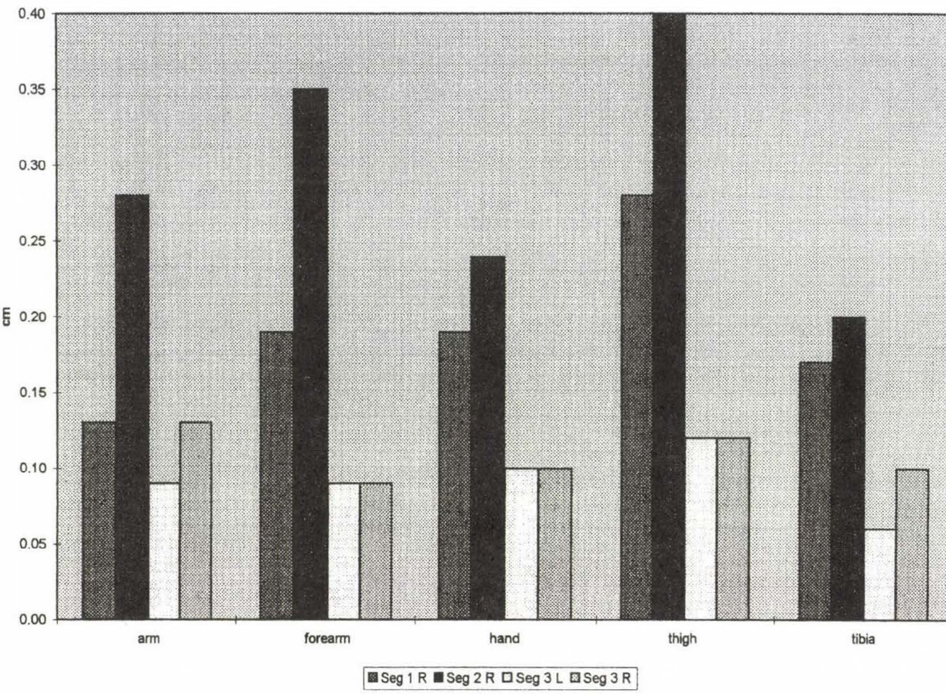

Fig. 5:

Discussion and Conclusions

In a previous paper by Carr (1993) we demonstrated that the rustic segmometer using filed cotter pins affixed with exoxy glue to an end pointer and an elastic band to the housing of a retractable carpenter's tape was a viable alternative to using the classical anthropometer. An ostensibly improved segmometer used in KASP in a team deployment yielded less precise values than those in the first study. One might attribute some of the difference to the precision of the team compared to Carr. Clearly, however, in the most recent study using the commercially available machined Segmometer 3, Carr was able to demonstrate new standards of precision for segmental lengths.

For those wishing to replace the anthropometer with segmometers as discussed in this paper, we have included a full description of techniques in Appendix A. We trust the information will encourage the measurement of long bone growth that heretofore may have been discouraged by the cost of anthropometers used for this purpose.

Acknowledgments: Rosscraft for instruments used in the preliminary studies of a longitudinal study of gymnasts at Western Washington University. Precision data for the Segmometer 2 was from the Kinanthropometric Aquatic Sports Project supported by grants from the Australian Sports Commission, Western Australian Ministry of Sport and Recreation, Eceed Sports Nutritionals Company, the Department of Human Movement Studies of the University of Western Australia and institutions of the international measurement team. We recognize too the contribution of Wayne Wilson in the studies related to the first segmometer.

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Appendix A

Measurement of Lengths

The landmarks for marking and measuring subjects in a comprehensive measurement protocol such as that in KASP are as follows:

Landmarks (including those used for measuring lengths)

Landmarks are defined points on the body used for reference for the application of instruments. Location of landmarks is a crucial part of the technique for obtaining accurate and precise measurement. A fineline felt or ball point pen with washable ink enables the anthropometrist to identify the underlying skeletal structure. In order to avoid ambiguity in the text or identifying the anthropometrist by a sexist pronoun, or awkward non-sexist phases, we address the reader as YOU and couched the text in a how-you-do-it style. We specify each landmark or technique tersely in an incomplete sentence. The general procedure for identifying a landmark is: (1) locate, (2) release and relocate, (3) mark, (4) check. The technique requires the use of the lateral nail of the thumb and distal nail of the index fingers of both hands. Cut and file your nails so they extend only slightly when you apply pressure to the fleshy portion of your thumb and index fingers. This assures subject comfort. Moreover, with properly groomed nails, landmarking and measuring can be done wearing rubber gloves without appreciable loss in accuracy as determined in student experiments.

With practice the following landmarks can be obtained very rapidly and accurately. The releasing, relocating and checking is automatic, assuring the surface of the skin does not distort the location of the landmark. Both hands are used in the process. We have included some nuances in how-to-locate landmarks on atypical subjects. Do not use these except when necessary. Normally, the sequencing in landmarking is unvaried with minimum manipulation and posing of the subject.

Do not innovate or teach nondescript anthropometry. If you propose an alternate procedure for location of a landmark or technique, provide the rationale and assemble the evidence. Petition the Chairman of the ISAK Working Group on Standards and Instrumentation for a considered opinion. Present the case formally, report the technical error of measurement on your proposed procedure and the standard procedure, and show the systematic difference between median values of each. This was done for the use of the segmometer and direct length procedures in this chapter, approved on the basis of economy, ease and precision, and later reported in the literature by Carr et al. (1993). In other instances, the proposition may be accepted as a "nuance" or occasional augmentation such as the hip manipulation to locate the trochanterion, recumbent position for measuring abdominal skinfold, and a double grasp for the measurement of front thigh skinfold.

(Note: Dr. J.E.L. Carter, San Diego, is the current Chairman of the Working Group on Instruments and Standardization of the International Society for the Advancement of Kinanthropometry.)

Acromiale: the point at the superior and external border of the acromion process of the scapula. (1) Place your pencil alongside the external border of the scapula to identify the superior margin. (2) Locate the most superior lateral margin with the left side of your left thumb. (3) Release and relocate with your left index finger nail. (4) Mark with a small horizontal line. (5) Check with the left side of your left thumb nail while your right thumb nail locates the radiale.

Radiale: The point at the upper and lateral border of the head of the radius. (1) Using your right thumb nail palpate downward in the lower portion of the lateral dimple of the elbow to locate the head of the radius. (2) Release and relocate with left index finger (a slight pronation/supination of the subject's forearm is reflected by a rotary movement of the head of the radius). (3) Mark. (4) Check using the side of the nail of your left thumb while you use the nail of your right thumb to locate the stylion.

Stylion: The most distal point on the processus syloidus radius. This is located in the so called "anatomical snuff-box" identified when the thumb is extended and adducted. (1) Place your right thumb nail in the box defined by the tendons (of the extensor carpi radialis longus and the adductor policus longus). Locate the stylion, the most distal tip of the radius. (2) Release and relocate with the nail of your left index finger. (3) Mark. (4) Check with the nail of the thumb of your left hand, freeing your right hand to start to locate the mesosternale.

Note: The stylion is the landmark for obtaining forearm length. We prefer a direct measure of hand length from the mid-stylion point to the dactlyion using the segmometer rather than deriving hand length from projected lengths of the stylion and dactlyion (Carr et al. 1993).

Mesosternale: The point on the corpus sterni at the intersection of the midsagittal and horizontal planes, at the mid-level of the fourth chondrosternal articulation. (1) A two-handed palpation method provides for rapid location of the landmark. You place your index fingers on the clavicles on either side of the manubrium sternum while your thumbs locate the first costal spaces, thus encompassing the first ribs. (2) Then move your index fingers to replace the thumbs that are lowered to the second intercostal spaces to identify the second ribs. (3) You repeat the procedure for the third and fourth ribs. (4) Mark the mesosternale that is at the mid-point of the sternum at the level of the center of the articulation of the 4th rib with the sternum.

Iliospinale: The most inferior tip of the anterior superior iliac spine. (In matters of adjusting for clothing, point to the site and tell the subject you wish to make a mark. Men invariably pull down their shorts, some women do, but mostly women and children pull up on the leg of their shorts). (1) Grasp the subject's left hip about the inquinal level with your left hand, use your thumb to palpate anteriorly to locate the undermost point of the anterior superior iliac spine. Occasionally, you will find it difficult to locate. Ask the subject to stand on his or her left foot, raise the heel of the right foot and rotate inwards and outwards on the ball of the right foot. The movement of the sartorius muscle can be traced to its origin at the site of the landmark. (2) As usual, release and relocate with the nail of the index finger. (3) Mark using a small cross mark. (4) Check using the nail of your left thumb.

Trochanterion: The most superior point on the greater trochanter of the femur. Location of this landmark requires a persistent technique. The subject takes a short stride forward resting the right foot on a raised object about 15 cm high. Stand behind the subject and locate and mark the trochanterion as follows: (1) Stabilize the subject's left hip with your left hand, (2) Palpate using the thenar eminence of your right palm (i.e., pad on the thumb side) by pushing on the lateral aspect of the subject's gluteal muscle to locate the right trochanter that is on a line with the long axis of the femur. (3) Identify the uppermost part by firm downward pressure of your hand. (4) Then have subject carefully assume the erect stance with weight equally distributed on each foot, and the toes pointing directly forward. (5) Use the side of your right thumb as a wedge to palpate anteriorly and upward on the head of trochanter to locate the most superior point. (6) Release the pressure and reapply with the nail of your left thumb or index finger. (7) Mark the site on the relatively undistorted skin surface. (8) Check with the right thumb assuring the site is directly over the trochanterion. Occasionally, in locating the landmark, you can ask the subject to extend his or her hip laterally, or, bend the knee and move the thigh forward and backward. If you are still doubtful, relocate the landmark when subject is recumbent on a table lying on the left side and facing away from you.

Tibiale Laterale: The most proximal point of the margo glenoidalis of the lateral border of the head of the tibia. It is often easier for you to locate the landmark by having the subject flex his or her leg at the knee, or sit down. The tibiale laterale is located as follows: (1) Find the depression or dimple in the knee, bounded by a triad of promenences: epicondylar femur, anterolateral portion of the head of the tibia, and the head of the fibula. (2) From this orientation, press inward using the side of your right thumb as a wedge, locate the border of the tibia, and palpate posteriorly until you locate the landmark, which is the most superior point. This is at least one-third of the anterior posterior distance. (3) Release, relocate with the nail of the index finger and mark. (4) Check pressing downward using the nail of your right thumb. (The tibiale laterale is approximately in the same transverse plane as the tibiale mediale.)

Tibiale Mediale and *Spherion Tibiale:* These landmarks define the length of the tibia. The subject sits and crosses his right leg over the left thigh presenting the medial side of the tibia. (1) Locate the proximal border of the tibia with the nail of your right thumb. (2) Release and relocate with the nail of your left index finger. (3) Mark. (4) Check using the nail of your left index finger pushing downward to the bony margin while searching for the spherion tibiale with your right thumb nail. (5) Locate the spherion tibiale, the most distal point on the tibia (not the lateral protuberant malleolare) with your right thumb nail. (6) Release and relocate with the nail of your left index finger. (7) Mark. (8) Check with the nail of your right thumb by pushing upwards to the designated landmark.

Mid-Acromiale-Radiale: A line is marked horizontal to the long axis of the humerus at the mid-acromiale-radiale distance, as determined by an anthropometric tape. (1) Wrap the anthropometric tape around the arm at the level of the mark, pinning the tape with your left thumb. (2) Mark horizontal lines at the level of the mid acromiale-radiale mark on the posterior and anterior surfaces of the surface of the arm. (3) With the subject having pendent arms with the hands along the high, make a vertical line at the most posterior surface to intersect with the horizontal line to mark the site where the triceps skinfold is raised. (4) With the subject very slightly rotating the hand outward, make a vertical line at the most anterior surface directly over the belly of the biceps brachaii to identify the site where the biceps skinfold is raised.

Mid-Stylion Line: The subject flexes at the elbow and presents the right wrist, palmar surface upward. (1) Wrap the tape around the wrist pinning it distal to the stylion ulnare and stylion radiale on the dorsal surface with your left thumb and second digit (it is not necessary to hold the case). (2) Draw a small line on the palmar surface at the proximal border of the tape in the mid portion of the wrist. (3) Release the tape and estimate the mid portion of the subject's wrist and make a cross on the previous line. (4) Check that the cross is in the mid portion and in line with the dactilion, the most distal point on the terminal phalanx III when the hand is extended with the fingers together.

Mid-Thigh: There are several methods for locating the mid-thigh. One is to use half the measured distance in a seated subject from the inguinal line at mid-thigh to the anterior margin of the patella. This is consistent with the technique for estimating the site for obtaining mid-thigh skinfolds. For girth measurement we prefer defining the mid-thigh as half the measured distance from the previously located trochanterion to the tibiale laterale when the subject stands erect. (1) In identifying this level you place anthropometric tape zero indicator on the marked site on the trochanterion and pin it there with pressure from the third digit of your left hand. (2) Let the tape hang freely and hold it to the thigh with your outstreched left thumb. (3) Extend the tape downwards and note the distance to the previously marked tibiale laterale. (4) Estimate half the distance on the tape held in place with your third finger and thumb and mark the lateral thigh at this level.

Lengths

Lengths (direct segmental or projected). Instructions for direct segmental and projected lengths (heights) are organized under two headings: Instruments and Techniques, as follows:

(1) Instrument: Rosscraft Segmometer is a replacement instrument for the anthropometer for obtaining direct segmental lengths and projected lengths (heights) from a measuring box. The segmometer consists of a base pointer and a sliding pointer on a flexible 105 cm tape. The indicator permits reading to 0.1 cm. The Segmometer 3, represents further refinement earlier versions designed to replace the traditional anthropometer (Carr et al. 1993, Ross et al. 1992, Norton et al. 1996, and Ross 1996). The recent version

features a looped tape with machined end- and sliding-pointers ans illustrated. Direct lengths are measured from the internal edge of the sliding pointer. Projected length, from a box top are measured at the laser engraved scratch line that subtracts the thickness of the base pointer. In manufacturing, the pinters are tumbled to achieve a satin finish for black anodizing. A machined track with Teflon insert and a fiber adjustment screw ensures smooth passage of the tape without lateral play. Ostensibly simple, the manufacture of the Segmometer 3 requires 13 milling, 7 drilling, 5 taping, 2 riveting, 2 tumbling, 2 anodizing, 2 laser and 10 assembly operations on each instrument (see <Segmometer 3> Fig. 4.).

(2) Technique: During direct and projected measures on the upper extremity, the subject stands erect with arms at the sides, and palms against the thighs. The segmometer sliding pointer is held in the left thumb and index fingers as one would hold a pencil. The pointer end is similarly grasped by the right thumb and index fingers. In the direct length technique, the upper landmark is approximated by the index finger of the left hand which anchors to the skin surface, stabilizing and protecting against penetration by the pointer. The sliding pointer is extended by the right hand to the lower site. In all direct measurements, the reading is made from the inside edge of the sliding pointer (not the scratch line that is used for projected measurements).

ACROMIALE-RADIALE LENGTH (arl). The distance from the acromiale to the radiale. The subject stands erect with arms extended downward and palms pressed against the side of the thigh. The anthropometrist anchors the end pointer with the index finger and rotates the pointer to the acromiale. The sliding pointer is placed on the radiale. Reading is from inside edge.

RADIALE-STYLION LENGTH (rls). The distance from the radiale to the stylion. The subject maintains the same position as for the acromiale-radiale lenght. The end pointer is placed on the radiale and the sliding pointer on the stylion. The orientation of the tape is such that it parallels the long axis of the radius. Reading is from inside edge.

MIDSTYLION-DACTYLION (dsl). The shortest distance from the midstylion line to dactylion III. The subject extends the right hand supinated (palms up), fully extending the fingers. The end pointer is place on the marked midstylion line, the sliding pointer held in the right hand is then applied to the dactylion, the most distal point of the third digit. Reading is from inside edge.

ILIOSPINALE HEIGHT (ish). Projected height from the box to the iliospinale. The subject stands the feet together facing the box, heels together with feet on either side of a corner of a box. The end pointer is placed flush on the box and the sliding pointer extended vertically upward to the marked iliospinale landmark. Reading is from the scratch line.

TROCHANTERION HEIGHT (tro h). Projected height from the box to the trochanterion. The subject stands with the feet together and facing away from the anthropometrist with the side of the right lower extremity against the box. The end pointer is placed flush on the box and the sliding pointer extended vertically upward to the marked trochanterion site. Reading is from the scratch line.

TROCHANTERION-TIBIALE LATERALE LENGTH (tr-tll). Distance from the trochanterion to the tibiale laterale. The subject stands on the box with feet together with the lateral surface of the right lower extremity facing the anthropometrist. The end pointer is anchored by the left index finger to the marked trochanterion site. The sliding pointer is extended with the right hand to the marked tibiale laterale. Reading is from inside edge.

TIBIALE LATERALE HEIGHT (til). Box to the tibiale laterale. The subject stands on box as above. The end pointer is placed flush on the box and the housing pointer extended vertically upward with the right hand to the marked tibiale laterale site. Reading is to the marked scratch line. Reading is from inside edge.

TIBIALE MEDIALE-SPHYRION TIBIALE (ti-sp). Direct length from tibiale mediale to sphyrion tibiale. The subject sits on the box and crosses the right leg over the left leg to present a horizontal medial surface of the leg. The end pointer is applied to the tibiale mediale site by firmly anchoring the left index finger to the proximal tibia border and placing the end pointer on the marked site. The sliding pointer is extended to the marked sphyrion tibiale, the most distal point on the medial malleolus, anchoring the right index finger slightly distal to the landmark and manipulating the sliding pointer to the exact site. Reading is from inside edge.

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Anthrop. Közl. *38;* 217-222. (1996/97)

GROWTH STUDIES AND GOVERNMENT OF INDIA'S POLICY FOR CHILD HEALTH AND CARE

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Abstract: *Growth studies do not only study the process of human development but also analyse the relationship between growth variability and well-being. Growth is a powerful indicator of the social and economic environment of human populations. An attempt has been made to highlight the growth studies presently being carried out in India with an insight on possible intervening factors (scientific, social, and medical) which is the main focus of the paper.*

Key words: *Growth studies; Indian Government.*

A high quality early childhood care programme provides a safe and nurturing environment, promotes the physical, social, emotional and cognitive development of young children while responding to the needs of the families.

Such programmes assume special significance in India since children in the age group of 0 to 14 years form about 40% of India's total population (Figure 1). In 1981, there were 137 million children in India and by 2001 the number of children is expected to be 289 million or more than the total population of USSR (based on the medium projections of populations made by K.S. Natrajan of the office of Registrar General). This high proportion of child population in our country warrants the need for providing living conditions which will enable children to realize their full potential for development.

The situation in our country unfortunately is otherwise. About 50% of children are living in conditions of deprivation - more than half of them are below 6 years - most critical period of growth and development. About half to 2/3rd of children from economically disadvantaged section of society are malnourished. In a Survey it was estimated that 3/4th of the pre-school children suffer from malnutrition (NNMB 1982, NIN, ICMR, Hyderabad 1984).

Integrated Child Development Services (ICDS) programme is the country's most comprehensive intersectoral programme for holistic development of the young child and is being implemented by the Department of Women and Child Development. The programme aims at substantially alleviating the condition of socio-economic deprivation prevailing in the society by providing multi-dimensional services in an integrated manner for survival and development of children. ICDS programme was launched in the country twenty years ago in 1975-76 with a handful of 33 projects on an experimental basis. Since then it has grown manifold and is now on its way towards universalization. At present with the 3, 907 ICDS projects the programme has already covered more than 67.2 percent of the total Community Development Blocks in the country and is reaching out to 17.8 million children and 3.8 million expectant and nursing mothers.

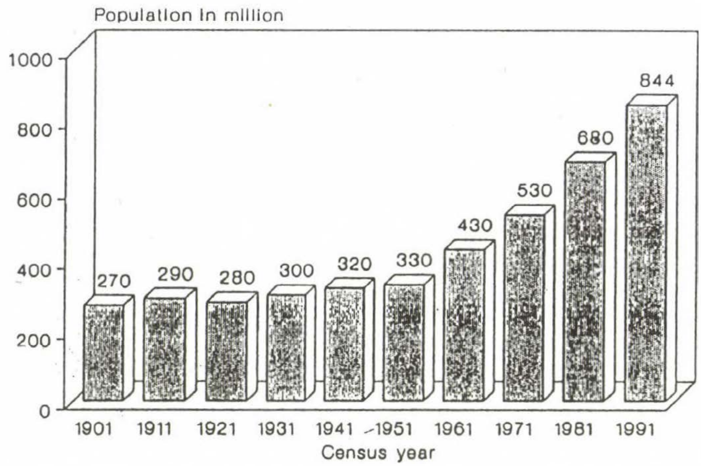

Fig. 1: Growth of the population in India, and distribution of the population by age groups in India (includes projected population)

Age-group (percentage)	**1971**	**1981***	**1991**	**1996**	**2001**
0 - 4	14.51	12.55	12.62	11.57	10.46
5 - 9	14.96	14.08	12.04	11.15	10.21
10 - 14	12.55	12.22	10.89	10.99	10.27
15 - 19	8.66	9.64	10.80	9.93	10.10
20 - 34	21.91	22.61	24.63	26.01	26.30
35 - 59	21.43	21.66	22.45	23.28	24.74
60 - 0+	5.94	6.54	6.54	7.07	7.70
All Ages (mn population)	548.16	685.16	837.25	913.25	986.10

* *Excludes Assam*
Figures for 1991, 1996 and 2001 based on 'medium projection'
Source: Registrar General

Over the years ICDS has been extensively studied. The scientific evidence accumulated powerfully proves that the programme has had its impact on the main components of human resource development i.e. health, nutrition, education etc.

In Delhi it operates through 2,800 Aganwadis (nursery school) in various parts of the city which provides the largest and the most important network of services for urban poor children (Situational Analysis: Tuli and Abrol 1990).

The National Policy on Education (1986) has given priority to the child care programme. It has taken into care the holistic nature and has emphasized the need for organizing programmes for all round development of the children.

In the Policy the need for establishing it linkages between ICDS and ECCE programmes has been stressed. Such programmes in the first instance is to be directed to the most underprivileged groups, those who are still outside the mainstream of formal education (Ministry of HRD, 1986 - Programme for Action - National Policy on Education).

It is only when a secular trend in growth of our children i.e. with children of each generation becoming taller and healthier than those of preceding generations, till a phase showing the attainment of full expression of genetic potential is reflected by a Child Development Policy, it can be said to be a successful policy. However till 1990, no such trends has been there in poor communities except in Kerala. (Gopalan 1992)

In many parts of the world where growth-retardation is widespread, poor diets go hand in hand with poor environmental sanitation; infections tend to aggravate the effects of dietary inadequacies on growth. Growth-retardation under these circumstances, often represents the summation effect of primary undernutrition attributable to poor dietaries and conditional undernutrition attributable to super added infections which increase nutrient requirements and inhibit absorption and assimilation of nutrients; and it is often difficult to quantify the respective contributions of each of these twin attributes of the poverty syndrome to the end picture of growth retardation.

NNMB - The National Nutrition Monitoring Bureau - which is a part of India's National Institute of Nutrition has been doing anthropometric, diet and nutrition surveys among representative population groups in India for nearly two decades. In the years between 1977 and 1989 in both boys and girls of 1 to five years age group, there has been a decline in the severe grade of malnutrition (from 15% to 9%) (Gomez). There has been an increase in children in normal range (6 to 10%) - there has been a marginal increase in mean height and weight at different age points between the two survey periods.

These data suggest that a secular trend with respect to growth has at long last set in even among the poor income groups.

From these data it is evident that improvement in growth of the children may be achieved by control of infections in situations wherein the communities are subject to factors such as inadequate diet and very heavy load of infections due to improper sanitation.

In Table 1 to 2 data on heights and weights of children of affluent section of the population from 5 cities of India have been compared with the section of poor children in the country.

Table 1: Mean heights (cms) of boys (1-5 years)

Age		Affluent Indian*					Poor Indian**
(yrs)	NCHS	Ludhiana	Delhi	Varanasi	Calcutta	Bangalore	
1+	82.4	80.3	81.0	79.9	83.0	80.1	73.9
2+	90.4	90.2	91.1	89.3	91.5	90.4	82.1
3+	99.1	98.4	98.0	96.4	97.6	98.0	89.5
4+	106.6	105.5	103.9	103.0	103.9	104.6	96.5
5+	113.1	112.0	110.2	108.8	110.2	110.1	101.8

Source: * - NFI scientific Report 11, 1991.
** - NNMB Report 1988-90, NIN, ICMR.

Table 2: Mean weights (kg) of boys (1-5 years)

Age		**Affluent Indian***				**Poor Indian****	
(yrs)	**NCHS**	**Ludhiana**	**Delhi**	**Varanasi**	**Calcutta**	**Bangalore**	
1+	80.9	80.0	81.5	79.6	79.8	79.4	72.5
2+	90.0	90.3	89.9	88.0	89.6	88.1	80.7
3+	97.9	98.3	96.4	95.5	97.0	96.0	97.8
4+	105.0	105.5	103.1	**101.8**	102.9	102.8	95.2
5+	111.6	112.1	110.0	108.3	107.8	109.1	100.9

Source: * - NFI scientific Report 11, 1991.
** - NNMB Report 1988-90, NIN, ICMR.

The NNMB Surveys cover mostly the general population comprising the great majority of poor children. The Nutrition Foundation of India also collected data on affluent children in major cities of India as part of a study designed to find out if the NCHS growth standards were also applicable to Indian children the data indicate that the children belonging to different region are in different stage of development transition. The children of Punjab and Delhi have apparently already achieved a level of growth performance that nearly corresponds to the International Growth standard based on NCHS data.

Table 3: Percentage distribution of Pre school Deviation (SD) classification India

SD classification according to	**Period**	**-3SD**	**-3SD to -2SD**	**-2SD to -1SD**
Weight / Age	1975-79	38.0	39.5	18.3
(underweight)	1988-90	26.6	42.0	24.2
Height / Age	1975-79	53.3	25.3	14.6
(Stunting)	1988-90	36.8	28.3	21.0

National Nutrition Monitoring Bureau, report on repeat surveys, (1988-89) National Institute of Nutrition (1991).

A comprehensive range of health and nutrition programmes of the Government of India, including the National Vitamin A Prophylaxis programme, National Iodine Deficiency Disorders Control Programme, Nutritional Anaemia Prophylaxis Programme, Child Survival and Safe Motherhood Programme, Universal Immunization Programme, Control of Diarrhoeal Diseases Programme and Control of Acute Respiratory Infections Programme, provides access to primary health care for over 80% of our children. Similarly, universal access to safe drinking water and safe disposal of excreta, necessary for the prevention of many diseases is being promoted by the drinking water supply and sanitation program of the Government of India.

The availability and control of human economic and organizational resources at different levels of society for children and women are influenced by the status of the girl child and women. The National Plan of Action for the SAARC Decade of the Girl Child of the Government of India aims at providing equal opportunities for the development of girl child. A special package of services to improve the situation of adolescent girls is also being implemented in 507 ICDS blocks.

Education plays an important role in determining how resources are being utilized to secure food, care and health for children and women.

The major determinants of malnutrition of women and children are poverty illiteracy and in-adequate health care availability? Especially high level of female illiteracy prevent families from using available resources and health care facilities optimally (Gopalan 1987). Ryan et al. (1984) reported that mother's education had a significant role in improving calcium and B-carotene intake of the family (Southern India). An earlier study from rural Punjab in India (Levinson-Morinda 1974) also showed that high income and mother's knowledge of proper nutrition were associated with high calorie intake.

In a study done by Gajanan et al. (1993) in urban slums of Bombay it was found that educated mothers belonging to higher socio-economic status had a better knowledge regarding dietary requirements during lactation as compared to the illiterate and economically poorer women. Though there is a general improvement in the level of knowledge attitudes and supplementary feeding, very few women were found to have scientifically correct information. It was therefore suggested that in order to improve the knowledge of mothers and bring about positive improvement in the practice regarding breast-feeding and weaning it is important that key messages in nutrition-education be provided and reinforced to community health workers involved in maternal and child health care.

The national plan of action for children in India, puts special thrust to health, nutrition and education to meet the time-specific targets. The plan envisages to reduce the severe and moderate malnutrition among children under five by half of 1990 level by turn of the century.

During the last few years, child health nutrition programme directed at pre-school children have received considerable attention. There still is a great deal of growth-retardation.

The prevalence of Grade I and Grade II malnutrition in the preschool children is indeed somewhat higher than a decade ago. This is perhaps due to the fact that though we had pushed strategies for control of child mortality, they have not gone hand in hand with strategies for promotion of child nutrition.

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(Swastha Hind Volume 37 No. 9. 235-238.)

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Anthrop. Közl. 38; 223-229. (1996/97)

Kiszely György 1909-1997

1909. október 11-én született Szatmárnémetiben. Ott érettségizett 1927-ben. 1934. december 22-én avatták orvosdoktorrá a Pázmány Péter Tudományegyetemen.

Huzella Tivadar professzor intézetébe került mint díjas tanársegéd 1940-ig. Majd adjunktusi kinevezést nyert ugyanitt. 1944. május 31-én egyetemi magántanárrá habilitálta őt a Kar. „A fejlődés szövettana" címmel tartotta próbaelőadását. 1952-től a MTA Minősítő Bizottsága az orvostudomány kandidátusa címmel ajándékozta meg. 1963-ig a Budapesti Orvostudományi Egyetem II. Anatómiai Intézetében orvosi biológiát adott elő, amely szigorlati tárgy lett.

1963. augusztus 10-től a Szegedi Orvostudományi Egyetem tanszékvezető tanára és az Orvos-biológiai Intézet igazgatója. Itt oktatott és kutatott 1977. június 30-ig. Ez idő alatt egy több emeletes monolit beton épületet emeltetett, és ezzel valóban megalapozta az orvos-biológiai tanulmányokat és kutatási lehetőségeket Szegeden is.

1977-ben, 68 éves korában nyugdíjba vonult. 1992-ben a szegedi Szent-Györgyi Albert Orvostudományi Egyetem emeritált professzora. Betegsége mind inkább elhatalmasodott, és 1997. augusztus 4-én visszaadta lelkét Teremtőjének.

Méltatni Őt megtisztelő feladat, de hogyan tegyem, hogy hű legyen minden, amit most leírok. Tíz évig szeretve tisztelt tanítómesterem volt, aki nemcsak az ügyetlen lépteimet vigyázta a tudományokban, de a mindennapi cselekedeteimben, családi megmozdulásaimban erkölcsileg és nem egyszer anyagilag is sokat segített.

A gyászjelentésében benedfalvi Dr. med. habil. Kiszely György professzor emeritus szerepel. Nekem: Gyurka bácsi Ő, akiről oly jó most megemlékeznem, hiszen ilyenkor is Vele vagyok.

Iskolát alapított, amely Huzella orvos-biológiai eszméjét tükrözte. Aurája volt. Karizmatikus egyéniségével tömegeket vonzott példátlanul jól megszervezett előadásaira. Igazi ember volt, akinek ellenségei nem, de irigyei sokan voltak.

80. születésnapján köszöntöttem Őt azzal a kínai mondással, hogy aki egy fiút nemzett és egy könyvet írt, az megtette a kötelességét az emberiséggel szemben. Kiszely professzor úr ezeken felül sokkal többet tett: ezreket és ezreket oktatott. Nincs nagyobb erkölcsi jó, mint átadni a tudást egy másik generációnak. Ezt Kiszely professzor úr - szeretve tisztelt tanítómesterem - maradéktalanul teljesítette.

Nem halt Ő meg, mert akire emlékeznek: él.
Nem halt Ő meg és mégis ... nagyon hiányzik.

A SOTE Baráti Körének - amelynek tiszteletbeli elnöke volt - november 26-án rendezett összejövetelén, megemlékezve Róla elmondtam a középkori Cellano imáját, amelyet Verdi csodálatos Requiemjének utolsó mondatából vettem:

LIBERTA TE DOMINE DE MORTE AETERNA ...
LIBERTA TE ...

Horváth László

Herbert Bach
1926–1996

1996. július 12-én elhunyt Németország egyik vezető antropológusa, Herbert Bach. Ő volt az a szakember, aki még a nehéz időkben programot tudott felvázolni és el tudta fogadtatni a humángenetikát az NDK-ban. Ő bővítette ki a korábbi jénai Antropológiai és Etnológiai Intézetet.

A thüringiai Gotha-ban született 1926-ban. A háború és hadifogság után Erfurtban és Jénában végezte tanulmányait. A jénai Ernst-Haeckel-Házban (múzeumban) kezdte tudományos pályáját (1952-56), 1957-ben promovált, 1962-ben habilitált. 1963-tól docens és az antropológia tanára, 1969-től igazgatója az Antropológiai Intézetnek. 1981-ben megbízták őt a Humángenetikai Tanszék vezetésével. Az ő érdeme, hogy a két intézményt összeolvasztotta, és ma „Institut für Humangenetik und Anthropologie" néven négy osztállyal (Fejlődésbiológia, Paleoantropológia, Humángenetikai Tanácsadás, Citogenetika), a korábbi hattal szemben ma már több mint 30 munkatárssal működő nagy intézet fejlődhetett ki.

Soha nem lehetett volna őt egyoldalúsággal vádolni. Oktató munkája sokrétű volt, és mindig sok hallgató, doktorandus dolgozott mellette. Többirányú kutatást vezetett, illetve folytatott. Fő területe a történeti antropológia volt, de a humángenetikában is figyelemre méltó munkát végzett. Mindezeket széleskörű munkacsoportok létrehozásával tette, régészekkel, történészekkel, filozófusokkal stb., illetve klinikusokkal, fogászokkal, gyermekgyógyászokkal, biológia tanárokkal stb. dolgozott együtt. Ezekből az együttműködésekből több monográfia is született. Bach professzor könyveinek, könyvfejezeteinek, tudományos dolgozatainak száma 150 felett volt. Több mint 250 tudományos és ismeretterjesztő előadást tartott. Ő kétségkívül az egykori NDK-ban az antropológia és a humángenetika meghatározó személyisége volt. Több tudományos társaságnak, több szakfolyóirat szerkesztőbizottságának volt a tagja. A Csehszlovák Antropológiai Társaság tiszteleti tagjává választotta őt.

Bach professzorra a nagy aktivitás, objektivitás, kötelességtudat, kollegialitás, a soha nem csökkenő optimizmus volt jellemző. Barátságos modorával, kedves egyéniségével azonnal jó kapcsolatot tudott teremteni bárkivel. Bizonyára ez is közrejátszott abban, hogy a németországi politikai változások után őt kérték fel, hogy az átvilágító bizottság elnökeként vizsgálja meg a jénai egyetem oktatóinak korábbi tevékenységét. Ezt a munkáját nagy empátiával, nagyon korrekten, mondhatni, közmegelégedésre végezte el.

Herbert Bach egy fair gentleman, egy igaz jó barát volt. Eltávozásával nemcsak a német, hanem a nemzetközi antropológia is szegényebb lett. Kedves barátunk emlékét megőrizzük.

Eiben Ottó

Lothar Schott
1930–1996

Elhunyt Lothar Schott, a berlini Antropológiai Intézet nyugalmazott docense, a magyar antropológia régi barátja.

Tanulmányait 1949-ben a potsdami Pedagógiai Főiskolán kezdte, ahol történelemből, germanisztikából és pedagógiából szerzett oklevelet. Ezután a berlini Humboldt Egyetemen tanult őstörténetet és antropológiát (1953-56). Szakmai pályája Berlinben, az Őstörténeti és Régészeti Intézetben indult 1953-ban, majd 1955-től a Humboldt Egyetem Antropológiai Intézetében Hans Grimm professzor mellett folytatódott. 1957-ben promovált, 1961-ben habilitált ugyanazon az egyetemen, antropológiai témákból. 1962-ben nevezték ki docensnek, és ebben a minőségében dolgozott a berlini Antropológiai Intézetben 1989-ben történt nyugdíjazásáig. Még ugyanabban az évben visszahívták őt az intézetbe, hogy docensként tovább dolgozzék. Ezt - betegsége ellenére is - nagy kedvvel tette.

Szívesen tanított. Egyetemi előadásai, szemináriumai, gyakorlatai mellett 14 alkalommal tartott kurzust a Humboldt Egyetem Természettudományi Múzeumában biológus tanároknak a hominid evolúció témaköréből. Mindig voltak szakdolgozó hallgatói és doktoranduszai, akiknek a munkáját igen nagy körültekintéssel, lelkiismeretesen irányította.

Kutatásainak jelentős része a történeti antropológia területére esik. Életének utolsó szakaszában is a hominid evolúció problémáival foglalkozott, illetve a berlini népesség történetét kutatta. Szívesen foglalkozott tudománytörténeti kérdésekkel.

Mindemellett részt vett az akkori NDK tudományos életében. Több konferenciát rendezett, amelyeken külországbeli kollégák is részt vettek („Arbeitstagung mit internationaler Beteiligung", ahogyan akkor az NDK-ban nevezték és engedélyezték). Különösen emlékezetes az 1975-ben, Grimm professzor 65. születésnapja alkalmából Berlinben rendezett „Anthropologie der Frau", vagy az 1977-ben Werder-ben rendezett „Probleme der Ökologie des Menschen", avagy a prágai Károly Egyetemmel közösen 1979-ben rendezett „Mutter-Kind-Beziehungen in anthropologischer Sicht" című konferenciája. Ezeken az NDK-beli konferenciákon rendszeresen részt vettek a magyar antropológusok is (e sorok írója is tucatnyi alkalommal).

Lothar Schott többször járt Magyarországon. Azt lehet mondani, hogy mindig jött, amikor csak alkalma vagy lehetősége nyílt erre. Segítettük is őt ebben meghívásokkal. Végig látogatta az összes hazai intézetet, szinte minden magyar kollégát ismert. Többünkkel baráti kapcsolatot alakított ki. Őszinte nagyrabecsüléssel és barátsággal viseltetett irántunk. Mi is becsültük őt szakmai tudása, embersége, nyílt, őszinte kollegialitása okán. Halálával egy kitűnő antropológust, egy igaz embert veszítettünk el.

Emlékét megőrizzük.

Eiben Ottó

Ilse Schwidetzky
1907-1997

Prof. Ilse Schwidetzky
(Lesenyei Márta szobrászművész alkotása)

Ilse Schwidetzky (emeritus professzor, Dr. phil., Dr. h. c.) 1997. március 18-án bekövetkezett halálával nemcsak a német, de a nemzetközi antropológia is egy évtizedeken át meghatározó egyéniségét veszítette el.

Tudományos pályáját Breslau-ban (ma Wrocław) kezdte Freiherr E. von Eickstedt professzor mellett, majd Mainzban folytatta. 1961-ben vette át Mainzban a Johannes Gutenberg Egyetem Antropológiai Intézetét, ahol akkoriban a szociálantropológia és a populációbiológia voltak a fő témakörök.

Ragyogó intézetet alakított ki, tehetséges és aktív munkatársakkal (ma már valamennyi professzor). Hamarosan a történeti antropológia irányába fordult „Schwie" érdeklődése. (Így nevezték őt munkatársai, egyáltalán nem tiszteletlenül, sőt, inkább családias szeretettel.) Vezetésével egy hatalmas adatbankot alakítottak ki Mainzban, amely a prehisztórikus és a történelmi időkből előkerült emberi csontmaradványok metrikus adatait rendszerezi. Ma már mintegy 50.000 egyed adatait találhatjuk meg ebben az adatbankban.

Ugyancsak fontosnak tartotta a korszerű multivariációs statisztikai elemző módszerek antropológiai alkalmazását. Az első nagyobb munka a neolitikumból származó csontmaradványok elemzését és ezek alapján a prehisztórikus populációk megismerését célozta meg. Ebbe a munkába más nemzetbeli kollégákat is bevont, és a nemzetközi együttműködés e témákban is egyre szélesebb körűvé vált.

A történeti antropológia mellett a ma élő népességek antropológiájára is volt gondja. Nagy szervezéssel, számos ország igen sok antropológusának bevonásával megíratta és 14 Lieferung-ban kiadta a ma élő emberiség antropológiai bemutatását („Rassengeschichte der Menschheit", 1965-1993).

Tudományos kutatómunkájának eredményeit számos könyvében és számtalan tanulmányában tette közzé. Az egyik leggyakrabban idézett európai antropológus.

Igazi iskolateremtő professzor volt, akinek jól felépített, logikus előadásait mindig élvezte hallgatósága. Többször járt Magyarországon, több kongresszusunkon vett részt. Előadásai, a vele folytatott konzultációk mindig élményszámba mentek.

Schwidetzky professzor-asszony rendkívül aktív tevékenységet folytatott a németországi és a nemzetközi antropológiai közéletben. Alelnöke volt az Antropológiai és Etnológiai Tudományok Nemzetközi Kongresszusának és tagja a Permanent Council-nak. Tagja volt a Mainzi Tudományos Akadémiának és a Francia Antropológiai Társaságnak. 1968-70-ben ő volt a Német Antropológiai és Humángenetikai Társaság elnöke. Ilyen minőségében rendezte meg 1969-ben Mainzban a Társaság emlékezetes 11. kongresszusát, amelyen ketten Magyarországról is részt vettünk. Ezen kívül is több igen eredményes szimpóziumot rendezett. Itt kell megemlíteni szerkesztői munkáját is: mint a Homo szerkesztője, ugyancsak sokat tett a nemzetközi antropológiáért.

Ki kell emelni azt a nagylelkű, rendkívül hathatós támogatást is, amelyet folyamatosan nyújtott az akkori szocialista országok antropológusainak. Senki nem tett annyit a „vasfüggöny mögötti" országok antropológiájáért, mint ő. Kongresszusi meghívásokkal, ösztöndíjak szerzésével, tanulmányúti lehetőségekkel, de mérőeszközök és könyvek ajándékozásával is segítette sokunk munkáját. E sorok szerzője, mint az Európai Antropológiai Társaság elnöke (1986-88) javasolta és szorgalmazta, hogy Schwidetzky professzor-asszonyt az EAA tiszteleti tagjává válasszák, éspedig tudományos és tudományszervezői teljesítménye mellett éppen az itt említett tevékenységéért is. Javaslata nem kapta meg a szükséges támogatást.

Az Európai Antropológiai Társaság 1990-ben Wrocław-ban rendezett 7. kongresszusán „A breslaui antropológia kezdetei" címmel kívánta befejezni nyilvános szereplését, sajnos azonban ez (egyes kollégák előzetes tiltakozása miatt) meghiúsult. Nagyon szomorúan vette tudomásul...

Ezért is, 1991 decemberében, Schwidetzky professzor-asszony 85. születésnapját előkészítendő, W. Bernhard professzorral egyetértésben és az ő segítségével, e sorok írója Mainzban egy, az Intézetben rendezett tudományos ülés keretében köszöntötte az idős professzor-asszonyt, és átadta neki az őt ábrázoló bronzplakettet, Lesenyei Márta szobrászművész alkotását, az alábbi „Laudatio" kíséretében:

Sehr geehrte, liebe Frau Professor SCHWIDETZKY!

Earlauben Sie mir bitte, daß ich Sie von ganzem Herzen begrüße. Meine betonte individuelle Begrüßung könnte schon der Anfang der Jubileumsfeiern des Jahres 1992 für Sie, verehrte Frau Professor Schwidetzky, sein.

Ich begrüße Sie, die große Professorin der allgemeinen Anthropologie, die Verfasserin von vielen bedeutungsvollen, wichtigen Büchern und Artikeln, die Shöpferin des Begriffes „Bevölkerungsbiologie", welcher sich als rother Faden durch Ihre wissenschaftlichen Arbeiten zieht.

Ich begrüße die Herausgeberin und Reorganisatorin der Zeitschrift „Homo".

Ich begrüße Sie, liebe Frau Professor, die „Nummer 1" der europäischen Anthropologie, die nicht nur eine hervorragende Wissenschaftlerin ist, sondern auch die Mitbegründerin der weltberühmten anthropologischen Schule in Mainz, ein Rom der europäischen Anthropologie.

Ihre Wissenschaftspolitik war immer weise und - eben darum - sehr erfolgreich.

Ich vergesse es Ihnen nie, daß Sie so unerhört viel für die Anthropologie und für die Anthropologen der ehemaligen Ostblockländer getan haben. Und Sie taten es insbesondere damals, als eine solche Aktivität nicht immer und nicht allgemein erwünscht war - und dazu nicht anerkannt.

Unsere Bekanntschaft reicht zurück in die frühen 60-er Jahre. Sie beehrten mich mit Ihrer Freundschaft, und aus diesem Grunde bat ich um die Möglichkeit Sie zu ehren. Ich weiß es wohl, daß meine Begrüßung nicht vollkommen ist. Ich wollte nur darauf hinweisen, daß Sie, liebe Frau Professor, mit Horatius sagen könnten: „Exegi monumentum aere perennius". - Sie errichteten (in der europäischen und auch in der Anthropologie im allgemeinen) wirklich ein Denkmal, ein unvergänglicheres als Erz.

Erlauben Sie mir, bitte, liebe Frau Professor, daß ich Ihnen diese Bronzeplakette als Zeichen meiner Verehrung mit vorzüglicher Hochachtung überreiche.

Ich wünsche Ihnen eiserne Gesundheit und noch viele aktive Jahre - und noch mehr: Mögen Sie noch viel Freude in Ihrer wissenschaftlichen Tätigkeit finden!

Ad multos annos!

*

Schwidetzky professzor-asszony, a kitűnő tudós, a nagyszerű tanár, az erős lelkű, ám szeretetre méltó ember távozásával nagy űrt hagyott maga után. Emlékét hálával és tisztelettel megőrizzük.

Eiben Ottó

Anthrop. Közl. *38;* 231-234. (1996/97)

A MAGYAR BIOLÓGIAI TÁRSASÁG EMBERTANI SZAKOSZTÁLYÁNAK MŰKÖDÉSE AZ 1996. ÉS 1997. ÉVEKBEN

302. szakülés, 1996. február 26.

Szilágyi Katalin - Szathmáry László: Az erdőháti kutatások cephalometriai konklúziói
Almási László: Kézformavizsgálatok Beszterecen
Szathmáry László: Vlasac (egy aldunai késő-meseolitikus népesség) és az európai meseolitikum

303. szakülés, 1996. március 25.

Fóti Erzsébet: Történeti antropológiai adatbank a Közép-Duna medence területéből
Guba Zsuzsanna - Szathmáry László: A Duna és a Tisza szerepe a honfoglaláskori népességek regionális diverzitásában
Joubert Kálmán - Darvay Sarolta - Ágfalvi Rózsa: A 2-10 évesek új fejlődési lapja az országos longitudinális gyermeknövekedés vizsgálat adatai alapján
Eiben Ottó: Beszámoló indiai tanulmányutamról
Gyenis Gyula: Beszámoló nagy-britanniai tanulmányutamról

304. szakülés, 1996. április 26-27.

A Magyar Biológiai Társaság Embertani Szakosztályának Pediátriai-Antropológiai Szekciója, a Központi Statisztikai Hivatal és a KSH Népességtudományi Kutatóintézettel együttműködésben szervezett tudományos ülése

Demográfiai, társadalomstatisztikai és hománbiológiai vonatkozások
Pongrácz Tiborné - S. Molnár Edit: Gyermekekkel vagy gyermek nélkül?
Harcsa István: Gyermekek a családban
Kamarás Ferenc: Tizenévesek terhességi és szexuális magatartása
Joubert Kálmán - Ágfalvi Rózsa - Darvay Sarolta: Az országos reprezentatív mintán folyó longitudinális gyermeknövekedés-vizsgálat néhány eredményének ismertetése

Érzékszervi vizsgálatok az értelmi fogyatékos gyermekek és kisiskolások körében
Buday József - Kaposi Ilona: Értelmi fogyatékos gyermekek látás- és hallásvizsgálata
Rigler Endre - Dersy Béla: A vizuális kontroll szerepe óvodás és kisiskolás gyermekek labdakezelésében

Az elhízás, kóros kövérség vizsgálata I., testfejlettség
Halmy László: A gyermekkori és a felnőttkori elhízás összefüggései
Szöllősi Erzsébet - Jókay Márta: Túlsúlyosság és elhízás alakulása a fiúk gyermek- és ifjúkorában
Örley Judit: A funkcionális szomatometria jelentősége a gyermeknőgyógyászatban

Alkati összetevők egészséges és beteg gyermekeknél
Bodzsár Éva: A testforma és a nemi érés
Pápai Júlia: Sportoló leányok testösszetétele a serdülés időszakában
Szöllősi Erzsébet: Fiúk vitalkapacitásának fejlődése a gyermek- és ifjúkorban

Nagy-Szakáll Zsuzsanna - Péter Ágnes - Blatniczky László: Diabéteszes gyermekek komplex antropometriai vizsgálata

Az elhízás, kóros kövérség vizsgálata II., viselkedésvizsgálat
Czinner Antal: UH, CT és multi frekvenciás impedancia mérés előnyei és nehézségei a testzsír meghatározásában
Dóber Ilona: Az extrém-kövérség gyakorisága a pécsi iskolások körében az 1990-es években
Bihari Ágnes: Egészségi állapot monitorozásának lehetőségei az iskolaorvosi gyakorlatban
Joubert Kálmán - Darvay Sarolta - Ágfalvi Rózsa: Egy egyszerű módszer a kóros elhízással és a kóros soványsággal veszélyeztetett gyermekek közelítő megszűrésére
Gárdos Júlia: Szociodemográfiai rizikótényezők vizsgálata gyermekviselkedési kérdőív (Child Behavior Checklist) alkalmazásával

Kézformavizsgálatok, regionális antropológiai vizsgálatok
Almási László - Szathmáry László - Szilágyi Katalin - Guba Zsuzsanna: Erdőháti gyermekek kézformái
Guba Zsuzsanna - Almási László - Szathmáry László: A kéz dimenzionális összefüggésrendszere fiatalkorban
Szathmáry László - Almási László - Szilágyi Katalin: Az ujjhosszak fejlődési ritmusa
Szilágyi Katalin - Guba Zsuzsanna - Göncziné Szabó Terézia - Szathmáry László: Kvantitatív szomatikus jellegek variáció felnőttkorig
Mogyorósi Szabolcs - Szilágyi Katalin - Nyilas Károly: Regionális és társadalmi különbségek hatása a testi fejlettségre
Göncziné Szabó Terézia - Szilágyi Katalin - Nyilas Károly: A testi fejlődés tendenciái a besztereci gyermekek körében
Bakó Attila - Fritkó Zsuzsa: Fogazatrendellenességek mentálisan retardált egyéneknél

Poszterbemutató
Szathmáry László - Szilágyi Katalin - Nyilas Károly - Tóth Ilona - Guba Zsuzsanna: A fejméretek korrelációjának vizsgálata fiatalkorúak korcsoportjában
Almási László - Szilágyi Katalin - Szathmáry László - Göncziné Szabó Terézia: A fej dimenzióinak stabilizálódása felnőttkorig
Szilágyi Katalin - Almási László - Szathmáry László: Az alkati összetevők stabilizációja

305. szakülés, 1996. május 20.

Henkey Gyula: Bögöz-környéki székelyek etnikai embertani vizsgálata
Kustár Ágnes: A karos-eperjesszögi honfoglaláskori temető antropológiai vizsgálata
Tóth Gábor - Varga Tünde: Vörös-zöld színtévesztés gyakorisága két nyugatmagyarországi mintában
Szikossy Ildikó - Hargittai Gábor: Beszámoló a Malajzia 95 expedición végzett embertani vizsgálatokról

306. szakülés, 1996. október 21.

Eiben Ottó: Minőségbiztosítás a humánbiológiai vizsgálatokban
Gyenis Gyula: Szekuláris és életkori változások magyar egyetemistáknál
Beszámolók
Németh Ágnes: A 6. Nemzetközi Humánbiológiai Szimpóziumról (Veszprém, 1996. június 10-13.)
Pap Ildikó: A breszti igazságügyi antropológus továbbképzésről (Breszt, 1996. július 8-12.)
Szikossy Ildikó: A Matematika a biológiában kurzusról (Komotini, 1996. augusztus 1-14.)
Bodzsár Éva: Az EAA 10. kongresszusáról (Brüsszel, 1996. augusztus 19-22.)

307. szakülés, 1996. november 18.

Józsa László - Susa Éva - Szabó Árpád - Varga Tibor: József nádor és Alexandra Pavlovna szerveinek kórszövettani vizsgálata
Bogner Barna - Pap Ildikó - Berényi Ervin - Repa Imre: A váci Fehérek templomából származó természetes úton mumifikálódott holttest CT-vizsgálata
Pap Miklós - Szabó Györgyi - Göncziné Szabó Terézia: Gyermekek jellegvariációi a Bódva völgyi mintákban
Beszámolók
Kustár Ágnes: A washingtoni tanulmányutamról (1996. június 1-30.)
Marcsik Antónia: A Paleopathológiai Társaság 11. Európai ülésszakáról (Rolduc, Hollandia, 1996. augusztus 14-18.)
Farkas Gyula: A Honfoglaló magyarság - Árpád-kori magyarság című a magyar honfoglalás 1100. évfordulója alkalmából rendezett tudományos konferenciáról (Szeged, 1996. szeptember 12-14.)

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308. szakülés, 1997. január 27.

Török Katalin: A hallócsontok károsodása és az otitis media paleopathológiája
Rékó Gyula: Hisztológiai-hisztokémiai és elektronmikroszkópos vizsgálatok lehetőségei és eredményei a paleopathológiában
Joubert Kálmán - Darvai Sarolta - Ágfalvi Rózsa: A kóros elhízással vagy soványsággal veszélyeztetett gyermekek közelítő szűrése című kiadvány ismertetése
Joubert Kálmán: Beszámoló a Német Antropológiai Társaság 2. Kongresszusáról (Berlin 1996. október 3-6.) és a braunschweigi Antropológiai Intézetben tett tanulmányutamról

309. szakülés, 1997. március 3.

Csete Klára - Szabó Árpád: STR-rendszerek vizsgálata Dél-magyarországi népességekben
Győri Pál: Adatok óvodások testi fejlettségéről
Velkey László: A balkezesség és öröklődésének vizsgálata
Joubert Kálmán: Növekedési sebesség-különbségek fiúk és leányok között a korai csecsemőkorban

310. szakülés, 1997. május 26.

Farkas Judit - Farkas A. Judit: A lábnyomok alakulása az időben I.
Füredi Rita - Szántó Miklós - Szilágyi Tibor: Csípőtáji törés utáni járásfejlődés elemzése
Tóth Szabolcs - Szilágyi Tibor: Kinematikai mozgásanalízis alkalmazásának lehetősége az LCA rehabilitáció klinikai gyakorlatában

311. szakülés, 1997. október 20.

Szöllősi Erzsébet: A szekuláris trend alakulása a debreceni egyetemistáknál
Pap Miklós - Szabó Györgyi - Göncziné Szabó Terézia: A biológiai fejlődés és a szocioökonómiai tényezők összefüggése
Gyenis Gyula: Beszámoló a „VIIIth International Congress of Auxology"-ról (Philadelphia) és a jénai (FSU: Friedrich Schiller Egyetem) tanulmányutamról

312. szakülés, 1997. november 24.

Horváth László: Tanítómesterem Kiszely György professzor
Farkas Judit - Farkas A. Judit: A lábnyomok alakulása az időben II.
Pap Miklós - Szabóné Kádár Melinda: Dermatoglyphiai mintázatok a békéscsabai populációban
Nagy Attila - Pap Miklós: Dermatoglyphiai jellegvariációk a Bódva völgyi mintákban
Joubert Kálmán: Beszámoló a Tartuban (1997. október 12-16.) rendezett Nemzetközi Antropológiai Konferenciáról

S.É

KÖNYVISMERTETÉSEK

Anthrop. Közl. *38;* 235-243. (1996/97)

PRAG, J. *and* **NEAVE, R.**: *Making Faces: Using Forensic and Archaelogical Evidence.* (British Museum Press, London, 1997. 256 oldal, 130 fekete-fehér és 20 színes ábrával. ISBN 0 7141 1743 9. Ára: Ł 18.99)

Bármely épségben megmaradt koponya alapján rekonstruálható egy néhai egyén élethű, vagy az eredetihez igen hasonló arca. Az arcrekonstrukció készítés rendkívül összetett munka. Bár módszere tudományos alapokon nyugszik, gyakorlati alkalmazása nem csak anatómiai és szobrászati jártasságot, de kreativitást, ugyanakkor pontosságot és önfegyelmet is igényel. A „Making Faces" c. könyv szerzői, John Prag régész és Richard Neave anatómiai illusztrátor, különböző történelmi korszakokból és régészeti lelőhelyekről származó emberi maradványok arcrekonstrukciójára vállalkoztak. *John Prag,* a Manchester Museum régésze és az University of Manchester címzetes előadója, számos arcrekonstrukciós témájú cikk és értekezés szerzője. *Richard Neave* a University of Manchester Orvosi, Fogorvosi és Egészségügyi karának anatómiai és természettudományi illusztrátora. Igazságügyi és régészeti arcrekonstrukciós témájú cikkei széles körben ismertek.

A bevezető fejezet kitűnő áttekintést ad az arcrekonstrukció készítés tudománytörténeti hátteréről. Minden fejezet egy-egy esettanulmány, ha úgy tetszik „detektív történet", mely élők és holtak múltbeli rejtélyeit kutatja és lehetséges megoldásaihoz vezet. A szerzők nem csupán a hajdan volt személyek arcát rekonstruálták, hanem igyekeztek ábrázolni a hiteles történelmi környezetet és tisztázni a halál körülményeit.

A mai ember számára is megdöbbentően életszerűvé válik egy több ezer évvel ezelőtt történt esemény, ha a mozaikszerű történelmi forrásokat az ásatás helyszínén szerzett háttér-információkkal kerek történetté egészítik ki. Ilyen volt például az a természeti katasztrófa Kréta szigetén, amely következtében egy pap és egy papnő lelte halálát a Kr. e. 2. évezredben. A minoszi templom rituális emberáldozat bemutatására szolgáló szentélyében, feltehetőleg éppen az áldozat bemutatása közben lelték halálukat a földrengés következtében rájuk zúduló földtömeg alatt. A feltáráskor előkerülő csontvázak testhelyzete a menekülés utolsó pillanatait rögzítette. A férfi a szentély közepén a hátán feküdt, védekezőn felhúzott bal lábát és a koponyáját összezúzták a ráomló kövek. A fiatal nőnek még volt ideje menedéket keresve a szentély egyik szegletébe futni, őt ott érte a vég. Arcrekonstrukciójukat és tragikus történetüket megismerve, szinte személyes ismerőseinkké válnak a múlt névtelenségéből fölbukkanó arcok.

Olyan neves történelmi személyiségek arcát is rekonstruálták a szerzők, mint II. Fülöp, Makedónia királya, vagy a félig mitológiai alakként ábrázolt fríg Midas király. Nagy Sándor halott apját, II. Fülöpöt Verginában helyezték örök nyugalomra. Csontjai a holttest tökéletlen hamvasztása során megmaradtak ugyan, de összezsugorodtak, deformálódtak. Így az arcrekonstrukciót a koponya helyreállítása, a töredékes csontok kiegészítése előzte meg. A királyi csontok személyazonosságát a koponyán fellelhető (ókori szerzők tollából már jól ismert) sérülési nyomok is igazolták. Ilyen például a jobb margo supraorbitalison nyomot hagyó szemsérülés, mely következtében II. Fülöp elvesztette látását. Talán ugyanaz a kardvágás okozta a hosszanti csontheget, mely a jobb maxillán és facies zygomaticuson húzódik végig. A sérülések nyoma a rekonstruált arcon is jól látható. Az ún. nyers (színezetlen, haj és -szakáll nélküli) arcrekonstrukció nagymértékben hasonlít a korabeli faragványokon, szobrokon ábrázolt királyhoz. Ám a színezett, valódi hajjal és szakállal kiegészített változat, melyen a kifolyt jobb szem helyén tátongó vérző seb látható, hátborzongató, és az arcrekonstrukció lehetőségeinek és korlátainak problémáját veti fel. Véleményem szerint a túlzottan naturális ábrázolás túllép az arcrekonstrukció lehetőségein, hiszen olyan bizonytalan információkkal egészíti ki az arcot, ami rontja az ábrázolás tudományos hitelességét. Egy múltban élt személyről nem tudhatjuk ugyanis, hogy milyen volt bőrszíne, annak állapota, voltak-e bőrhibái, anyajegyei, ráncai vagy szőrszálai az arcán. Azt sem tudhatjuk, milyen volt szemszíne, ajakszíne vagy tápláltsági foka. Ezek a tulajdonságok túl egyediek, megjelenítésük sok hibalehetőséget hordoz. Ezért az igyekezet, mellyel élethűbbé kívánják varázsolni az arcot, pont az ellenkező hatást éri el. Az arc egy rémisztő, élettelen panoptikumi figuraként mered ránk, ráadásul a többletinformációnak szánt részletek elvonják a figyelmet a lényegesebb dolgokról. Gondoljunk csak arra, hogy sokszor egy részleteiben elmosódó festmény, vagy néhány jól eltalált vonallal megrajzolt portré mennyire hasonlít az ábrázolt személyhez, pusztán annál fogva, hogy az arc legjellemzőbb információit, arányait és karakterét hordozza. A tudományos hitelesség egyik fontos kritériuma, hogy belátjuk lehetőségeink korlátait, és bármennyire szeretnénk is, nem mondunk többet, mint amennyit bizonyítani is tudunk. Ezért nem törekedhetünk arra sem egy ismeretlen személy rekonstrukciója során, hogy az arckifejezéssel tükrözzük annak egyéniségét vagy lelkiállapotát. Erre csak egy másik műfaj, a portré készítője vállalkozhat, ami nem titkoltan a művész szubjektív látásmódja szerint készül és ezáltal a puszta fizikai megjelenítésen kívül belső tartalmakat is hordozhat.

A Kr. e. 6. században élt Midas király koponyarekonstrukciójának elkészítése jól illusztrálja a történelem, a mitológia, az orvostudomány és a véletlen összefonódásának alkotó lehetőségét. Midas király alakja több antik görög vázáról vált ismertté. Vajon miért ábrázolták a fríg királyt turbánja alól előmeredő, mókás, hosszú szamárfülekkel? Talán valamiféle karikatúrának szánták? A monda szerint Midas király igen ostoba volt és emiatt többször is pórul járt. Történt egyszer, hogy a kecskelábú Pán isten Apollónnal kelt versenyre muzsikálásban. A versenybíró tisztét Phoibos a hegy istene vállalta az egyenlőtlen vetélkedésben. Ahogy Apollón hozzáértő ujjal édes hangokat csalt ki a húrokból, elbűvölte vele hallgatóságát és a hegy istenét, aki mindjárt neki ítélte az elsőbbséget. Mindenki egyet értett ítéletével, csak az arra vetődő Midas király emelt kifogást ellene. Ezt megsokallván Apollón büntetésképpen úgy meghúzta Midas király fülét, hogy az mindjárt kinyúlt és olyan lett, mint valami csökönyös szamáré. Szőrpamacsot is tett a végére, és mozgékonnyá tette, hogy ezzel emlékeztesse a királyt ostobaságára. Természetesen, amikor Midas király sírja napvilágra került, a kutatók a mesterséges koponyatorzításon kívül semmi rendellenest nem találtak az idős férfi koponyáján. De ami az ókori embernek elfogadható magyarázatul szolgálhatott a furcsa jelenségre, az egy mai kutató számára nem jelent megnyugtató választ. Így az orvostudományhoz fordulva segítségért, különböző betegségekben keresték a magyarázatot. Ám sem a feltételezett neurofibromatózis, sem a sebaceous szarv vagy -cysta lehetősége nem bizonyult helyes diagnózisnak. A valódi ok megfejtéséhez egy véletlenül tett megfigyelés segítette hozzá a szerzőket. Az intézet egyik pakisztáni származású munkatársa, egy napon elfelejtette leborotválni füléről a szőrt, és ez felkeltette a Midas rejtélyen töprengők érdeklődését. Hosszas rábeszélés után sikerült rávenniük fülét amúgy szégyenlő kollégájukat, hogy a tudományos cél érdekében hagyja megnőni fülszőrzetét. Másfél év múltán, Dr. Ahmed fülét teljesen benőtte a 4-5 cm hosszú, dús, bozontos szőrzet és így remek modellül szolgált a király fülének megmintázásához.

A szerzők több lápi holttest arcát is rekonstruálták. Egy vaskori férfi holttestét a Lindow melletti tőzegláp őrizte meg Manchester közelében. A férfi valószínűleg egy rituális gyilkosság áldozata lett. Az Assen közelében fekvő láp egy kislány mumifikált tetemét rejtette. A teljesen eltorzult arc alatti koponyát csak computer tomográffal lehetett megvizsgálni. A koponya másolatát számítógép felhasználásával készítették el polysztirolból, a CT vizsgálat adatai alapján.

A modern bűnügyi személyazonosítási vizsgálatok során alkalmazott arcrekonstrukciós technika számos szakember munkáját fogja össze. Fogorvos, genetikus, régész, anatómus vagy radiológus egyaránt fontos adatokkal szolgál egy-egy kérdéses személy arcrekonstrukciójának elkészítéséhez és azonosságának eldöntéséhez. Ily módon sikerült azonosítani többek között azt a kuvaiti üzletembert, akinek feldarabolt holttestét több helyszínen találták meg a közelmúltban, Manchesterben. Koponyáját több mint 100 darabkából ragasztották össze, pótolva az arckoponya hiányzó részeit. A szerzők igazságügyi arcrekonstrukciói számos esetben segítették már a rendőrség munkáját Anglia szerte, azonosítatlan tetemek kilétének felfedésében.

A könyv a tudományos ismeretterjesztő munkák sorába tartozik, nyelvezete könnyed. Az eredendően érdekfeszítő olvasmány különböző tudományterületek, az embertan, az igazságügyi orvostan, a sebészet, a régészet, az irodalom és a néprajz ösvényeire vezeti el az olvasót. Bemutatja, hogy az arcrekonstrukció művészete számos más tudománnyal karöltve új távlatokat képes nyitni a múltba.

A rendkívül szép kiállítású könyvet bizonyára szívesen forgatják és olvassák majd a hazai szakemberek és más érdeklődők.

Kustár Ágnes

THOMAS, J. R. & NELSON, J. K.: *Research Methods in Physical Activity* (3. kiadás. Human Kinetics Publ. Champaign, 1996. 485 oldal, sok táblázattal és ábrával. ISBM 0-88011-481-9. Ára: $ 40.00)

Ez a könyv iskolapéldája a jó tankönyvnek. Bár a címben a szerzők a testnevelés- és sporttudomány számára ígérnek kutatási módszereket, valamennyi természettudományos (de akár társadalomtudományi) szakterület is nagy haszonnal olvashatja. A címben a „physical activity" helyett akár physical anthropology is lehetne. Már elöljáróban is ki kell emelni a könyv rendkívül jó szerkezetét, didaktikus közlésmódját és a humort sem nélkülöző stílusát.

A két szerző ismert szakember a sport- és testneveléstudomány területén, több amerikai tudományos társaságban vittek és visznek vezető szerepet. Termékeny szerzők, akiknek munkáit szerte a világban idézik.

Ez a könyvük négy részben, húsz fejezetben tárgyalja a kutatási módszereket. Az első részben öt fejezet ad áttekintést a kutatás folyamatáról. Ezekben a bevezető fejezetekben olvashatunk a kutatni kívánt probléma megfogalmazásáról, az irodalom felhasználásáról, a célravezető kutatási módszerek megválasztásáról és néhány, a kutatással összefüggő etikai kérdésről.

A második rész hat fejezetben ismerteti a kutatás-statisztikai és mérési koncepciókat. Egy hasznos statisztikai alapvetés után a variánsok egymáshoz való viszonyát, illetve a csoportok közötti különbségeket elemzi. Ez utóbbiak kapcsán számos példát hoz a t-teszt alkalmazására. Részletesen tárgyalja a multivariációs módszereket, azok minden alapvetően fontos változatát. Azután a non-parametrikus technikák bemutatása következik, végül a kutatásban előforduló variánsok mérése kerül sorra, igen sok gyakorlati példával.

A harmadik rész a kutatómunka különböző típusait sorolja fel, hat fejezetben. Az első két fejezet meghívott szerzők műve: Nancy L. Struna a fizikai aktivitás kutatásának történetéről, R. Scott Kretchmar pedig annak filozófiai aspektusairól ad áttekintést. A továbbiakban a „meta-analízisről", a kutatás-tesztelésről, az ún. pilot study-ról adnak igen részletes és jól használható áttekintést a szerzők. Olvashatunk a megfigyelésen alapuló és a kísérleteken alapuló kutatás speciális módszereiről és a kutatás mennyiségi és minőségi jellemzőiről, azok értékéről és értékeléséről.

A negyedik rész már a kutatás eredményeinek bemutatásához, a dolgozat vagy könyv megírásához ad tanácsokat. Három fejezetben ismerkedhetünk meg a szerzők elgondolásaival: hogyan építsük fel a dolgozatot, annak egyes fejezeteit. Nagy gonddal írnak az eredmények prezentálásáról és a diszkusszió szempontjairól, a táblázatok és az ábrák megszerkesztéséről. Szóba kerül a köszönetnyilvánítás kérdése, a közlésre kiszemelt folyóirat megválasztása, az Abstract megírásának szempontjai stb.

A húsz fejezethez Függelékek is kapcsolódnak: a szokásos statisztikai táblázatok; az Egyesült Államokban folyó sporttudományos kutatások rövid áttekintése; a személyi számítógépek szerepe a kutatásban; vizsgálati-lap és kérdőív minták. Végül bőséges irodalomjegyzék és név-, illetve tárgymutató zárja a kötetet.

A könyv didaktikus felépítését már a bevezetőben említettem. A szerzők négy szimbólumot alkalmaznak. A „szélrózsa" (Map) minden nagyobb fejezet elején logikus sorrendben utal a főbb pontokra, információkra, azok egymáshoz való viszonyára. A *kulcs* (Key word) az egyes fogalmak definícióit adja, a *könyv* (Read) az ajánlott irodalomra utal, míg a *villanyégő* (Major concept) a téma legfontosabb részeit jelzi.

Minden fejezet egy képzelt hallgató vagy kutató tanácskérő levelével és a szerzőknek erre adott válaszával kezdődik. Már a levelek aláírása is szellemes (például az egyik kérdező aláírása „I.M. Redundant" és a szerzők aláírása előtt az üdvözlet: „Methodologically Yours"). Az „Ima Bookworm" (magyarul: könyvmoly) aláírású levélre a szerzők Murphy-nek a kutatással összefüggő három törvényével válaszolnak: (1) Ha véglegesen megfogalmaztad a kutatásodra vonatkozó kérdéseket, nem érted az irodalmat. (2) Csupán, midőn már világosan megfogalmaztad kutatásod kérdéseit, akkor fedezel fel (az irodalomban) egy csomó egymásnak ellentmondó kutatási eredményt. (3) Tanulmányodnak, kutatásodnak csak akkor van értelme, ha kutatási kérdéseid határozatlanok (azaz bizonytalanok, ködösek, zavarosak).

A könyvet a Human Kinetics Kiadó a tőle megszokott elegáns, nagyon szép kivitelben jelentette meg, és biztosan nagy sikerre tarthat számot, és nemcsak az angol nyelvterületen.

Eiben Ottó

DE KNOP, P. - ENGSTRÖM, L-M. - SKIRSTAD, B. - WEISS, M.R. (Eds): *Worldwide Trends in Youth Sport* (Human Kinetics Publ., Champaign, 1996.311 oldal táblázatokkal, ábrákkal. ISBN 0-87322-729-8. Ára: $ 31.50)

Ez a tanulmánykötet egy 1993-ban Svédországban rendezett konferencia anyagát adja közre. Az International Council of Sport Science and Physical Education (ICSSPE) „Sport és Szabadidő Bizottsága" mint rendező húsz országból hívott meg szakembereket, hogy az ifjúsági sport területén végzett kutatásaikról beszámoljanak.

A kötet hat részre tagolódik. Az első rész két tanulmánya foglalkozik a nemzetközi sportkutatás főbb irányaival, az ún. alternatív sportolási formákkal (szabadidősport, különleges sportok, egészségügyi sportolás), mindezek társadalmi aspektusaival.

A következő négy rész az egyes földrészek ifjúsági sportját mutatja be: Észak- és Dél-Amerika (Brazília, Kanada, Egyesült Államok), Ázsia (Izrael, Japán, Kína), Európa (Belgium, Dánia, Anglia, Finnország, Németország, Hollandia, Norvégia, Lengyelország, Portugálai, Skócia, Spanyolország, Svédország), Óceánia (Ausztrália, Új-Zéland) területéről összesen húsz referátum olvasható. A legbőségesebb az európai rész a maga 12 fejezetével. Magyarországról nincs szó. A korábbi szocialista országok közül csak Lengyelországról van egy tanulmány, valamint a Németország tanulmány érinti az egykor volt NDK sportját. A legtöbb tanulmány szerzője szükségesnek tartja bemutatni az ifjúsági (azaz tömeg-) sportot, amely a sportpiramis alapját képezi, és „termeli ki" a legtehetségesebbeket, akik majd mint országuk bajnokai, eljutnak a piramis csúcsára.

A hatodik részben a konferencia összefoglalásaképpen a szerkesztők választ keresnek egy sor kérdésre: van-e világviszonylatban megfigyelhető tendencia az ifjúsági sportban? Megállapítják, hogy több fiú sportol, mint leány. A legnépszerűbb sportág a fiúk körében a labdarúgás, és mindkét nemben az úszás. Megfigyelték, hogy a sportra a szórakozási vágy és bizonyos társadalmi adottságok (szociális helyzet is) motiválnak. Kevés országban van külön szervezet a fiatal tehetségek felkarolására.

Az ifjúsági sport fejlődésében megnyilvánuló trendek között megemlítik a sportolási alkalmak és létesítmények számának az utóbbi tíz évben történt növekedését, a sport intézményesedését, ugyanakkor egyes országokban a szervezett ifjúsági sport csökkenését, és végül a gyermekek 7-8 éves korban a sportolásba való bekapcsolódását, és az ezzel együttjáró korai specializálódást, azaz egyoldalúvá válásukat.

A mai problémák között elsőként a tinédzserek lemorzsolódását említik, valamint azt, hogy az ifjúsági sportot is egyre inkább a felnőttek sportja befolyásolja (a sport egyre inkább „komoly munka" és egyre kevésbé játék), és a szülők szociális helyzete határozza meg, hiszen a felszerelés egyre drágább. Felvetődött az az etikai kérdés is, hogy ennek a sportnak vajon milyen és mekkora a nevelő hatása, az eredményesség-orientáció mellett nem sikkadnak-e el az ifjúsági sport eredeti célkitűzései. Végül a magasan minősített edzők hiánya is rontja az ifjúsági sport esélyeit. Mindez a fizikálisan inaktív fiatalok számának növekedéséhez vezet. Ezt a humánbiológusok is jól érzékelik növekedésvizsgálataik során.

A konferencia próbált mindezeknek a problémáknak az orvoslására ajánlásokat, egy jobb „ifjúsági sportpolitikát" kidolgozni. Ezek közül a legnagyobb kihívásnak a jól szervezett iskolai sportot és az iskolák és a klubok gyümölcsöző együttműködését tekintik.

Úgy gondolom, mindezekről Magyarországon is érdemes elgondolkodni.

Dr. Eiben Ottó

BODZSÁR, B. É. & SUSANNE, C. (Eds): *Studies in Human Biology* (418 oldal, sok táblázattal és ábrával. Eötvös University Press, Budapest, 1996. IBSN 963 463 003 0. Ára: 5.000,- Ft)

A 65. születésnapját ülő Eiben Ottónak kedves ünnepség keretében nyújtotta át a fenti címen megjelent tanulmánykötetet annak megszervezésében, szerkesztésében és kivitelezésében oroszlánrészt végző Bodzsár Éva. Az alkalomra a Veszprémben megrendezésre került „Sixth International Symposium of Human Biology" szolgált, amikor a kötet szerzői közül sokan személyesen is jelen lehettek a jeles alkalmon. A becses ajándék létrejöttét három földrész 18 országának 104 kutatója, köztük több világhíresség segítette azzal, hogy tanulmányt írt Eiben Ottó tiszteletére, és elmondhatjuk, hogy hasonló megtiszteltetésben kevés antropológusnak volt része. A 48 tanulmányból 19 munka szerzője magyar, ami jelzi a szakma hazai képviselőinek Eiben Ottó professzor iránt tanúsított kivételes nagyrabecsülését.

Az írások az alábbi területek köré csoportosulnak: elméleti kérdések (6 tanulmány), módszerek a gyakorlatban (7 tanulmány), növekedés és fejlődés (10 tanulmány), érés (6 tanulmány), szerkezet és működés (struktúra és funkció, 11 tanulmány), valamint népességek a jelenben és a múltban (8 tanulmány). A tárgykörök tehát felölelik a fizikai antropológia és humánbiológia egész területét. Nincs itt lehetőség arra, hogy valamennyi munkáról akár röviden is megemlékezzenek, egyesek kiemelése pedig igaztalan lenne a többiekkel szemben. Annyit azonban a kötet tartalomjegyzéke is tanúsít, hogy a munkák jelentős része vandonatúj kutatási eredményeket ismertet, vagy ha régebben megkezdett kutatásokat érint, azok új megfigyeléseiről, az eredmények újabb értelmezéséről nyerhetünk segítségükkel ismereteket.

Hajszolt világunkban az emlékkötetek értéke egyre becsesebb. Mert ha csak főhajtásnyi időre is, de megállásra és számvetésre kényszeríti a benne résztvevőket, ugyanakkor jó áttekintéssel szolgálnak egy-egy szakterületet pillanatnyi állapotáról, eredményeiről, gondjairól és megoldásra váló feladatairól. S ha mindez nemzetközi kutatógárda részvételével történik, ki-ki tárgyilagosabban értékelheti saját tevékenységének mértékét és értékét. Amikor tehát ezzel a kötettel további termékeny éveket kívánunk Eiben Ottó professzor úrnak, egyben kívánunk további előrehaladást az antropológia és humánbiológia szakterületének is, itthon és külhonban egyaránt.

Éry Kinga

PAŘÍZKOVÁ, J.: *Nutrition, Physical Activity, and Health in Early Life.* - A „Nutrition in Exercise and Sport" sorozatban. (295 oldal, táblázatokkal, ábrákkal. - CRC Press, Boca Raton-New York-London-Tokyo. 1996. ISBN 0-8493-7919-0. Ára: ($ 40.00)

Az ismert szerző legújabb könyvében - részben korábbi publikációinak felhasználásával is - újabb kutatási eredményeit adja közre, éspedig az élet korai szakaszára vonatkozóan. Tény, hogy az óvodás életkorú gyermekekkel foglalkozó növekedésvizsgálatok száma lényegesen kevesebb, mint az iskoláskorúaké. Különösen hiányzott egy olyan összefoglalás, amely a korai gyermekkorban lezajló testi fejlődés mellett egyben a fizikai aktivitás/megterhelés hatását elemzi, és a gyermekek táplálkozását is alaposan vizsgálja. Ez a könyv ilyen értelemben hiányt pótol.

A kötet 13 fejezetből áll, ezekhez négy függelék, bőséges irodalomjegyzék és egy eléggé részletes tárgymutató kapcsolódik.

A bevezető fejezetben a szerző felvázolja az egész életre szóló optimális egészségi állapot és erőnlét elérésének lehetőségeit. Kifejti ennek elméleti alapjait is. Áttekinti a leendő anya táplálkozásának kérdéseit.

Részletes beszámolót ad az óvodás gyermekek növekedéséről és szomatikus fejlődéséről a Csehországban (Csehszlovákiában), illetve Prágában végzett keresztmetszeti és longitudinális vizsgálatok alapján. Bőséges antropometriai program eredményeit adja meg, ideértve a testösszetétel jellemzőit is.

Ezután a kisgyermekek tápláltsági állapotának részletezése következik: alapanyagcsere, fehérjeigény, a zsír, a szénhidrátok, ásványi sók és nyomelemek, vitaminok vizsgálata alapján. A tápláltsági állapot értékelésének problémáját is itt vitatja meg, bizonyos nemzetközi kitekintéssel.

A fizikai erőnlét tesztelésének módszereit, illetve vizsgálatainak eredményeit foglalja össze a következő fejezetben. A továbbiakban a tápláltsági fok és a fizikai erőnlét összefüggéseit vizsgálja. WHO és FAO adatok alapján itt más országokban végzett vizsgálatok eredményeiről is olvashatunk. Szóba kerül az alultápláltság és a gyermekmunka problémája is. Ennek ellentéteként a következő fejezet már az obezitásról szól.

Hosszú fejezetben tárgyalja a szerző a környezeti tényezőknek a korai gyermekkorban kifejtett hatásait, előbb főleg a családi háttérből adódó hatásokat. A motoros serkentés, a testnevelés és a spontán fizikai aktivitás hatásai már a következő fejezet anyagát képezik. Ezután egy rövid fejezet az óvodás gyermekek morfológiai és funkcionális változásait veti egybe, majd a kísérletes eredmények összefoglalása következik. Felvázolja a szerző a perspektívákat is: miként hat a fizikai aktivitás, a betegségek korai megelőzése az egészséges életmód kialakítására, és mit kell tennünk ennek érdekében. Itt tehát ajánlásokat tesz a szerző.

A négy függelék a testtartás, a zsámolyteszt, a motorikus teljesítmények és a szenzomotoros teszt módszertanát adja közre. A 402 tételből álló irodalomjegyzékben a szerző 51 saját munkája is megtalálható.

A könyv fejezetei részletesen tagoltak, a sok táblázat és ábra jól informálja az olvasót. A jó minőségű nyomdai munka, a könyv elegáns megjelenése a CRC Press kiadót dícséri.

Jana Pařízkovának ez a könyve is nagy érdeklődésre tarthat számot több szakterület képviselőinek körében, és minden bizonnyal sikert fog aratni.

Eiben Ottó

ŠTEFANČIČ, M. - ARKO, U. - BRODAR, V. - DOVEČAR, F. - JURIČIČ, M. - MACAROL-HITI, M. - LEBEN-SELJA, P. - TOMAZO-RAVNIK, T.: *Ocena telesne rasti in razvoja otrok in mladine v Ljulbljani (An Assessment of Physical Growth and Development in Children and Youth in Ljubljana)* (169 oldal, 138 táblázat és 34 ábra. - Institute of Public Health of the Republic of Slovenia; Biotechnical Faculty, Department of Biology, University of Ljubljana kiadása, mint a Zdravstveno Varstvo *35.* kötet *1.* supplementuma, Ljubljana, 1996. ISBN 961-6202-00-6)

A szlovén kollégák jelentős növekedési adatsorokat közöltek a ljubljanai gyermekekről: a ljubljanai Egyetem Biotechnológiai Karának Biológiai Intézete és a szlovéniai Országos Közegészségügyi Intézet Kutatócsoportja közös kutatásáról számolnak be a szerzők. A könyv első része a vizsgálatok leírását adja, a második, nagyobb részt a táblázatok és ábrák teszik ki. Felvázolják a három vizsgálatuk körülményeit, a projektek címeit, a vizsgálatban résztvevő két említett intézményt, illetve a kutatásvezetőket (V Brodar, M. Macarol-Hiti, illetve M. Štefančič).

A vizsgálatba bevont gyermekek számát úgy alakították, hogy nemenként és korcsoportonként száznál több egyed alkossa a vizsgálati mintát. Így 1981/82-ben 1683 fiút és 1778 leányt (6-20 évesek), 1991/92-ben pedig 1265 fiút és 1250 leányt (7-18 évesek) vizsgáltak. Az antropometriai program 15, illetve 17 testméretet foglalt magában. Harmadik keresztmetszeti vizsgálatukat 1984/85-ben bonyolították le 0,5-5,0 éves kisgyermekek körében, 20 testmérettel.

A szerzők vizsgálataikkal a szekuláris trendre is adatokat kívántak nyerni. Összehasonlítást tettek a háború előtti adatokkal, és természetesen kimutathatóak a pozitív változások. Az iskoláskorúak általuk vizsgált két mintájának középértékei között viszont csak csekély pozitív szekuláris trend volt megfigyelhető, és szignifikáns különbségeket csak a 15 éveseknél találtak. Úgy ítélik meg, hogy a szekuláris trend lelassult vagy megállt. Hogy ez annak jele-e, hogy a ljubljanai gyermekek máris elérték a növekedési mintájukban megadott értékeket, vagy az utóbbi évtizedek kevésbé jó gazdasági körülményei miatt lassult le a folyamat, a szerzők ezeket a kérdéseket nyitva hagyták, és a 2000. évre tervezett újabb vizsgálataiktól várnak választ.

A könyv második részében az adatokat táblázatos formában adják közre a szerzők, mégpedig a tőlünk tanult módon, a fiúkéit kék, a leányokéit rózsaszínű alapon. Az 1991/92. évi vizsgálatokból percentiliseket is számítottak, és ezeket táblázatok és percentilis görbék formájában is bemutatják.

Ugyanebből a vizsgálati mintából a 10,5 és a 12,5 éveseket két egymást követő évben újra megvizsgálták, és ennek a szemi-longitudinális vizsgálatnak az eredményeit is közlik.

A szép kiállítású könyv fontos hozzájárulás a közép-európai auxológiai kutatásokhoz.

Eiben Ottó

TOMAZO-RAVNIK, T. (szerk.): *Antropološki zvezki* (Anthropological Notebook) 4. (192 oldal, táblázatokkal, ábrákkal. A „Društvo Antropology Slovenije" kiadása, Ljubljana, 1996.).

A szlovén antropológusok 1994. szeptemberében konferencia rendezésével emlékeztek nagy professzoruk, Božo Škerlj születésének 90. évfordulójára. A konferencián e sorok írója (akinek alkalma volt személyesen is ismerni Škerlj professzort) képviselte a magyar antropológusokat. E kötet a konferencia előadásait tartalmazza.

Božo Škerlj (1904-1961) volt a megalapítója az antropológiának Szlovéniában. Kitűnő felkészültségű antropológus volt, aki a szakma számos területén alkotott maradandót. Híresen jó tanár volt. Előadásait nemcsak antropológus, de régész és néprajzos hallgatók is rendszeresen látogatták. Jelentős volt nemzetközi aktivitása, sokat utazott. A világ számos vezető antropológusával állt folytonos levelezésben. Naplót vezetett, és ebből két könyvet is írt: „The Unknown America" (1955) és „Palms, Piramids, and Desert" (1956). Mintegy 15 könyvet és több, mint 200 tanulmányt írt. Fontosabb munkái, köztük kézikönyvek a következők: „Man" (1934), „General Anthropology" (1948), „On Human Races and Racism" (1949), „Human Development" (1950), „The Thinking Biped" (1963) és „Peoples without Metals" (1962). Tehetsége kitűnt még a festészetben (a konferencián kiállították képeit, figyelemre méltó alkotások!), meseíróként és zongoradarabok szerzőjeként is.

Škerlj professzorral való személyes találkozásunk alkalmával (1958. szeptember) emlékezetes beszélgetést folytattunk a gyermekek növekedéséről, éréséről. Ő az elsők egyike volt, aki a menarche és a pigmentáció (1927), illetve a menarche és a klíma (1932) összefüggéseit tanulmányozta. Emlékezetes beszélgetést folytattunk a női testalkat néhány speciális problémájáról, amelyekről ő már 1928-ban időtálló, azóta is sokszor idézett tanulmányt írt. Szemlélete a modern humánbiológia jellegzetes vonásait tükrözte.

A jelen kötet 17 tanulmányt tartalmaz. Ezek közül négy Škerlj professzor életét, munkásságát mutatja be, hét az antropológia különböző területeiről, hat pedig a rokon szakterületekről vetít fel egy-egy témát.

Tatjana Tomazo-Ravnik professzorasszony - úgy is mint közvetett tanítvány - tiszteletre méltó gondossággal állította össze ezt a szép kiállítású emlékkötetet.

Eiben Ottó

KRETSCHMAR, R. S.: *Practical Phylosophy of Sport* (281 oldal, táblázatokkal, ábrákkal. Human Kinetics, Champaign, 1994. ISBN 0-87322-619-4. Ára: Ł 29.50)

A szerző az Egyesült Államok egyik legismertebb sportfilozófusa. Könyvében „filozófiai utazásra" hívja meg olvasóit. Az a célja, hogy segítse az olvasót filozófiai ismereteinek elsajátításában, hogy megválaszolja az olvasó filozófiai kérdéseit, és hogy segítse őt a személyes sportfilozófiájának kialakításában.

A könyv 11 fejezete három részre tagozódik. Az első rész felkészíti az olvasót a filozófiai készségek kifejlesztésére, az emberi természet dualizmusa és holisztikus voltának bemutatásával. A második részben a szerző a sport és a testnevelés értékeit tárgyalja meg a filozófus szemléletével. A harmadik részben pedig arra tanítja az olvasót, hogy hogyan javítsa meg életét a foglalkozása révén, vagyis: hogyan alakítsa ki, hogyan alkalmazhatja, gyakorolhatja a filozófiai gondolkodást a sportban is.

Minden fejezethez ad filozófiai gyakorlatokat és azok megoldási kulcsát, illetve értékelését. Részletes tárgymutató zárja a kötetet. A jól tagolt, didaktikus felépítésű és elegáns kiállítású könyvével újabb sikert könyvelhet el a Human Kinetics Kiadó.

Eiben Ottó

SIDHU, L. S. - SODHI, H. S. - BHATNAGAR, D. F. (Eds): *Planing for Development of Sports in India* (133 oldal, táblázatokkal és ábrákkal. - Official Publication of Indian Association of Sport Scientists and Physical Educationists [IASSPE], Patiala, 1994. Ára: Rs. 300,- / U$ 40,-)

E tanulmánykötet az 1993. áprilisában rendezett konferencia anyagát, 13 előadást tartalmaz. A fő kérdés, amelyet körüljártak, az volt, hogy tudja-e befolyásolni a sporttudomány a sport fejlődését Indiában. Ezt Sodhi fejti ki. Felvázolja az indiai sport infrastruktúrájának tervezett fejlesztését. Ebből az derül ki, hogy az 1969. évi állapothoz képest közel húszszor, az 1976. évihez képest közel tízszer annyi sporttelepet, sportcsarnokot és uszodát kívánnak létesíteni. Ha ez teljesül, nem maradhat el az eredmény sem. Abban is egyetértettek a konferencia résztvevői, hogy mennyire fontos az iskolai sport kiemelt fejlesztése. Ami a sportágakat illeti, a korábbi gyeplabdás hagyományok megőrzése mellett más sportágak fejlesztését is szükségesnek tartják, így elsősorban az atlétikát és a tornát. Előadások hangzottak el a felsőoktatás és a sportkutatás kapcsolatáról, a sport tudományos hátteréről, a sportolók táplálkozásáról, a sport és társadalom kapcsolatáról (ez Indiában különösen fontos kérdés). Áttekintést kaphatunk az élsport földrajzi megoszlásáról a kontinensnyi országban. Végül a jövőbeni fejlesztést vitatták meg a konferencián.

Ez a kötet újabb tanújelét adja annak a céltudatos tudományos törekvésnek, amellyel indiai kollégáink minden tekintetben, így a sporttudomány eszközeivel is országuk, népük javát kívánják elősegíteni.

Eiben Ottó

VINCENT, W. J.: *Statistics in Kinesiology* (127 oldal, sok táblázattal és ábrával. - Human Kinetics, Champaign, 1995. ISBN 0-87322-699-2. Ára: Ł 19.50)

A szerző, aki a California State University tanára és több mint 25 éve tanítja ott a kvantitatív analízist, ebben a könyvében azt mutatja be, hogyan lehet megérteni a matematikai-statisztikai elemzés alapvető módszereit. Példáit a kineziológia területéről hozza, de természetesen ezek más szakterületek kutatásaiban is eredményesen alkalmazhatók.

A könyv 12 fejezetében áttekinthetjük a matematikai-statisztikai feldolgozás és a legfontosabb elemző eljárások széles skáláját. Foglalkozik a szerző a kutatási adatok rendezésének kérdéseivel, az egyes jellegek variációival, illetve azok megjelenítésével, a normalitás kérdéseivel, a korrelációval, a kétszeres és többszörös regresszióval. Bemutatja a t-próba alkalmazását és más, három vagy több adattömeg elemzésére alkalmas próbákat. Kitüntetett érdeklődésre tarthat számot az ismételt mérések során talált variánsok elemzése, illetve a még fejlettebb statisztikai eljárások bemutatása. Végül a nem-parametrikus adatok elemzésével zárul a módszerek tárgyalása.

A könyv utolsó 50 oldala a függelékként csatolt matematikai-statisztikai táblákat, a könyvben használt szimbólumok értelmezését és az egyes fejezetekben alkalmazott példák megoldását, a problémákra adott válaszokat tartalmazza. végül a Glossary mintegy 200 szakkifejezés definícióját sorolja fel.

A könyv nagy értéke a didaktikus felépítése, a kifejezetten gyakorlati orientáltsága. Mindez a még kevésbé járatos szakembereket is eligazítja a kutatásaik során adódó matamatikai-statisztikai problémák megoldásában. Csak remélni lehet, hogy a relatíve olcsó ár a magyar kollégák számára is elérhetővé teszi ezt a kitűnő, szép kiállítású könyvet.

Eiben Ottó

KNUSSMANN, R.: *Vergleichende Biologie des Menschen. Lehrbuch der Antropologie und Humangenetik.* (524 oldal, 38 táblázat és 318 ábra. - Gustav Fischer Verlag, Stuttgart - Jena - Lübeck - Ulm, 1996. ISBN 3-437-25040-X)

Knussmann professzor tankönyvének ez a 2. kiadása 16 évvel az első kiadás után jelent meg (az első kiadás ismertetését lásd az Anthrop. Köz. 1983. évi, 278. kötetének 200. oldalán). A címoldalon az is olvasható, hogy ez teljesen átdolgozott kiadás. Ezt igazolja a jelentősen megnövekedett terjedelem (412-vel szemben itt 524 oldal) és az ugyancsak megszaporodott ábraanyag (298 helyett 318). A könyv szellemében is történt némi változás, és ez elsősorban az utóbbi másfél évtized új tudományos eredményeinek köszönhető.

Ennek az újabb, átdolgozott kiadásnak a beosztása nagyjából megegyezik az első kiadásével, ugyanúgy öt részre tagozódik. Egyes témák azonban, amelyek az első kiadásban alfejezetek voltak, itt most önálló, részletesebben kidolgozott fejezetet alkotnak.

Az antropológia történetének és a szakma módszertanának áttekintése után a második rész az emberi öröklődés elveit, a normális és patológiás öröklődés tárgyalását adja. A harmadik rész a nemi és életkori differenciálódás, a növekedés és érés, a testalkati variációk problémakörét öleli fel. Ezt követi a negyedik, filogenetikai rész, az ember származása és geográfiai differenciálódása, a rasszok bemutatása. Az ötödik, populáció-biológiai rész az emberiség biológiai jövőjének felvázolásával zárul.

A legfontosabb bővítések leginkább három témakört érintenek. A humángenetikai fejezetben a molekuláris genetikai szemlélet uralkodik, és eszerint bővült ki ez a fejezet. Így már jobban megfelel a tankönyv az alcímének, amellyel kapcsolatban az első kiadásnál még voltak hiányérzeteink. - A konstitúcióbiológiai fejezet ugyancsak bővült, mind terjedelmében, mind ábraanyagában. - A harmadik fontos témakör bővítését a természetes igények is megkövetelték: az újabb leletek kissé módosították a hominid evolúcióról vallott korábbi képet. A molekuláris biológia és a immunológia új eredményeit figyelembe véve egyes fejezeteket, alfejezeteket át kellett írni. Ugyancsak teljesen új szöveg olvasható a nemek közötti pszichológiai különbözőségekről írott fejezetben. A rasszokról írott idekapcsolódó fejezet szintén tartogat újszerű leírásokat, és a szerző itt kiküszöböli az első kiadás néhány félreérthető megfogalmazását. Úgyszintén át kellett írni az utolsó fejezetet, ahol az emberiség biológiai jövőjét, a népesség génállományának változását, a mai embernél megfigyelhető szelekciós mechanizmusokat, társadalmi és biológiai tényezők szelekciós hatását, továbbá a mutációs veszélyeket stb. vázolja fel a szerző.

Habent sua fata libelli: az első kiadásban kifogásolt hibás 5. ábra (amely a bőr/zsírredővastagság mérését lenne hivatott bemutatni), ebben a kiadásban is változatlanul megjelent.

A könyv végén további irodalmat is ajánl a szerző az egyes témakörökhöz, éspedig bevallottan elsősorban német nyelven megjelent munkákat. Mégis szokatlan, hogy a több, mint száz ajánlott tétel között alig több mint tucatnyi az angol nyelvű, egyéb nyelven megjelent munkák egyáltalán nem is szerepelnek a jegyzékben. A Tárgymutató - a könyv megnövekedett terjedelmének megfelelően - jelentősen bővült.

A biológus hallgatóknak szánt tankönyv jó stílusával, gazdag illusztrációs anyagával tűnik ki. Amint a könyv első kiadásáról is elmondható volt, a mostani második kiadás is változatlanul a jelenlegi legjobb összefoglalás a német nyelvterületen. Hozzátehetjük, hogy nemcsak antropológusoknak, de számos rokonszakterület képviselőinek is hasznos információkat ad. A könyv szép kiállítása a G. Fischer Kiadót dícséri.

Eiben Ottó

COSTA, D. M. & GUTHRIE, S. R. (Eds): *Women and Sport* (399 oldal, sok táblázattal, ábrával. - Human Kinetics Publ. Champaign, 1994. ISBN 0-87322-686-0. Ára: Ł 36,50)

A könyv 22 tanulmánya áttekintést ad arról a hosszú folyamatról, amelyet úgy határozhatnánk meg: a sportban megjelenő nőktől a női sportokig. A könyv alcíme interdiszciplináris áttekintést ígér. A tanulmányok három nagyobb témakörbe való sorolásával is ezt érzékeltetik a szerkesztők (mindketten a Long Beach-i California State University tanárai). A tanulmányok 23 szerzője helyenként provokatív módon fogalmazza meg a női sporttal összefüggő történeti, orvosi, biológiai, pszichológiai, szociológiai stb. kérdéseket.

Az első részben nyolc tanulmány tárgyalja a sportolás történeti és kulturális kialakulását, a kezdetektől az olimpiákon való részvételig. A második rész hat biológiai és orvosi tanulmányt foglal keretbe. Arról olvashatunk itt, hogy a nők fizikai képességei a férfiakéval egyenlőek, ha nem jobbak. Rövid tanulmányok érintik a különböző sportágakban szereplő nő-versenyzők testösszetételét, cardiovascularis erőnlétét, izomerejét és állóképességét. Két tanulmány részletezi a sportoló nők endokrinológiai vonatkozású történéseit (amonorrhea), illetve a sportolásnak a csontrendszerre gyakorolt és az egész életre kiható befolyását. A harmadik rész nyolc tanulmányban a pszichológiai és szociológiai aspektusokat tárgyalja meg. Ez a legterjedelmesebb rész, míg mi szívesen olvastunk volna többet a biológiai és orvosi témákról.

Részletes tárgymutató, valamint a szerkesztők és szerzők rövid bemutatása zárja a kötetet, amely a Human Kinetics Kiadótól megszokott, gazdagon illusztrált, elegáns formában jelent meg. A kötet elsősorban a hazai sporttörténészek, sportopszichológiai és sportszociológiai szakemberek érdeklődésére tarthat számot, de a második rész néhány tanulmánya a humánbiológusoknak is mond újat.

Eiben Ottó

FARKAS L. GYULA: *Fejezetek a biológiai antropológiából.* (JATEPress - Szeged, 1996. Egyetemi jegyzet. I. kötet 265 oldal ábrákkal és táblázatokkal. Ára: 1430,- Ft. II. kötet 125 oldal ábrákkal és táblázatokkal. Ára: 769,- Ft.)

Az egyetemi jegyzet Dr. Farkas Gyula szerkesztésében készült. Tartalmában felöleli az antropológia valamennyi fontos területét, amely egy biológusnak vagy egy biológia tanárnak szükséges. Kiadása igen időszerű, mivel Lipták Pál: Embertan és emberszármazásban c. tankönyve utolsó kiadása óta (1980) a három antropológiai oktatást végző tudományegyetem nem rendelkezik jól használható, általános hazai tankönyvvel. (Egy-két résztémával foglalkozó helyi jegyzet vagy praktikum jelent meg csupán.)

Az I. kötet a recens antropológiával foglalkozik 15 fejezetben. Társszerzői: Dr. Gyenis Gyula (6. fejezet), Dr. Kocsis S. Gábor (8. és 15. fejezet) és Dr. Marcsik Antónia (15. fejezet).

A bevezetés (I. fejezet) után tárgyalja az antropológia tárgyát, történetét résztudományait és a tudományokban való elhelyezkedését. A metrikus jellegekben (3. fejezet), a morfológiai jellegekben (5. fejezet), a fogazatban (8. fejezet), a fiziológiai jellegekben (9. fejezet) külön ismerteti a történeti és a ma élő népességek és egyének vizsgálati módszereit. Kiemelendő a 4. fejezet fontossága és hasznossága a biometriai módszerek legáltalánosabb alapfogalmainak, próbáinak ismertetésével. Ezekben a feldolgozási módszerekben a hallgatók nagy része teljesen tájékozatlan, amikor az antropológia tantárgy hallgatására kerül sor.

Ugyancsak igen jelentősek a bőrlécrendszerről (6. fejezet), az egyedfejlődésről (10. fejezet), az antropogenetikáról (13. fejezet), paleopatológiáról (15. fejezet) szóló fejezetek, melyek az előző tankönyvünkben nem, vagy csak igen érintőlegesen szerepeltek. Megjegyzésem, hogy a 13. fejezet populációgenetikai részét a demográfia felé kissé ki lehetett volna bővíteni. Az emberi nemi dimorfizmusáról szóló 12. fejezet valamennyi (nem csak a biológia szakos!) tanárnak figyelmébe ajánlható, elsősorban a hibás szexuális beállítódások és deviáns magatartásformák ismertetése miatt.

A II. kötet a humán evolúcióit, annak szubhumán és humán fázisait, a humán taxonomiát és a magyarság őstörténetét tárgyalja. Társszerzői: Dr. Gyenis Gyula (2. fejezet) és Dr. Végh Gyula (6. fejezet).

A kötet nem elsősorban a leletek ismertetésére, hanem az evolúció áttekintésére és bizonyítékaira helyezi a hangsúlyt. Kiemelendő a 6. fejezet, mely az evolúcióval kapcsolatos filozófiai, ismeretelméleti kérdéseket tartalmaz, teista és ateista megközelítésben. A taxonómiai részben a nagyrasszok és rasszok jellemzése mellett kitér a rasszizmus ismertetésére és kritikájára is. A magyarság őstörténete - bár elég szerény terjedelemben - ismerteti annak tudományos és áltudományos nézeteit.

A jegyzet valamennyi fejezete után irodalomjegyzék található, amely lehetővé teszi az érdeklődő hallgatók ismereteinek bővítését, elmélyítését.

Szilágyi Katalin

* * *

Egy XIX. századi kérdés

Teremtés vagy evolúció? Ebben a kérdésben ma is ellentét van a teológia és a szaktudományok között. - állítja Farkas L. Gyula (1996, 97-91. lap). Hogy egyházi természettudósok és teológusok mégis evolucionisták, azt Farkas azzal magyarázza, hogy az evolúció tagadása ma már lehetetlenné vált.

Nem világos, hogy az „egyházi" szó nála papot vagy egyszerűen csak hívőt jelent-e? A helyes magyarázat mindkét esetben ugyanaz: egyházi (vagy más) szakemberek a téma lenyűgöző érdekessége miatt foglalkoznak az evolúció kutatásával. Ezt tapasztalatból állítom.

Fennmarad és megvizsgálandó az ellentét kérdése.

A mai természettudományos világkép szerint (Hawking, 1989) a Világegyetem egy óriási robbanással („Big Bang") kezdődött, számítások szerint 10-20 milliárd évvel ezelőtt, és azóta tágul. Az idő a Világegyetem egyik dimenziója, amely a Big Bang óta látszik. Valószínűleg egy nagy összeroppanással („Big Crunch") fog végződni. Ez a világkép a csillagok színképének 1929-ben felfedezett vörös eltolódásából indult ki.

Ez a sajátos Világegyetem „csak úgy" létezik, vagy teremtés eredménye? Az első válasz ingyenes, de némelyek számára kívánatos. A teremtés válasza viszont logikailag kielégítő. Természetesen egyik válasz sem természettudományos, hanem metafizikai.

Hogy állunk hát az evolúcióval? Közvetlenül belátható, hogy a Teremtő az általa teremtett világon kívül áll, így az idő dimenzióján is. Az idő számára egyidejűség. Ebben a távlatban teremtés és evolúció nem különböztethetők meg. A XIX. századi kérdés értelmetlenné vált.

Irodalom

Farkas L. Gyula (1996) *Fejezetek a biológiai antropológiából.* II. - Interpress, Szeged.
Hawking, S. (1989) *Une breve histoire du temps.* - Flammarion, Paris.

Thoma Andor

Folytatás a borító 2. oldaláról

6. A táblázatok címeit, az ábraaláírásokat, a táblák címeit és azok minden szöveges részét két példányban külön is mellékelni kell a kézirathoz az idegen nyelvű fordításhoz.

7. A tanulmányok statisztikai feldolgozásánál alkalmazott matematikai képletek jelöléseinek pontos magyarázatát meg kell adnia a szerzőnek. Ugyanez vonatkozik görög betűs vagy egyéb speciális jelölésekre is. Általában a Biometria Értelmező Szótár (Szerk.: Jánosy A. - Muraközy T. -Aradszky G. - Mezőgazdasági Kiadó, Budapest, 1966.) előírásait, jelöléseit célszerű követni.

8. A tanulmányok tagolásában az alábbi beosztási elvek követését tartjuk kívánatosnak: 1. Bevezetés (a probléma felvetése, mai állása). 2. Anyag és módszer. 3. A vizsgálat, kutatás eredményei és azok (összehasonlító) értékelése. 4. Összefoglalás.

9. A tanulmány, közlemény végén irodalomjegyzéket kell megadni, de csak azok a művek idézhetők, amelyeknek adatait vagy megállapításait a szerző tanulmányában valóban felhasználta, akár a szöveges részben, akár a táblázatok vagy ábrák elkészítésénél. Az irodalomjegyzéket a szerzők nevének „abc" sorrendjében kell összeállítani. A szövegben a szerző neve után (zárójelbe) tett évszámmal utalunk a megfelelő irodalomra.

A folyóiratok címeinek rövidítésére a szakirodalomban kialakult és elfogadott rövidítéseket alkalmazunk.

Az irodalomjegyzék összeállításához az alábbi példák szolgálnak útmutatásul:

Folyóiratcikkeknél a szerző(k) vezetékneve, rövidített utóneve, a megjelenési év zárójelben, kettőspont, a közlemény címe, a folyóirat hivatalos rövidítése, aláhúzva a kötetszám arab számmal, aláhúzva, pontosvessző, oldalszám, például:

BARTUCZ, L. (1961): Die internationale Bedeutung der ungarischen Anthropologie. - Anthrop. Közl. *5*; 5-18.

Könyveknél a szerző(k) neve, a kiadási év zárójelben, kettőspont, a könyv címe, aláhúzva a kiadó neve, a kiadás helye, például:

BARTUCZ L. (1966): *A praehistorikus trepanáció és orvostörténeti vonatkozású sírleletek* (Palaeopathologia III. kötet). Országos Orvostörténeti Könyvtár és Medicina Kiadó, Budapest.

Másodidézeteknél - ha azok el nem kerülhetők - az idézett szerző neve után *cit.* szócskát írunk, és a fenti módon idézzük a könyvet vagy a folyóiratcikket, illetve *in* szócskát írunk, ha tanulmánykötetben megjelent cikket idézünk.

Ha egy szerzőnek ugyanabból az évből több tanulmányát idézzük, akkor az évszám mellé írt a, b, c betűkkel különböztetjük meg őket.

10. A szerzők a nyomdai tipografizálásra vonatkozó kívánságaikat a kézirat másodpéldányán jelölhetik be ceruzával, a nyomdai előírásoknak megfelelően.

Kérjük szerzőinket, hogy a fenti alaki előírásokat - a tanulmányok gyorsabb megjelenése érdekében is - tartsák meg. Az előírásoktól eltérő kéziratokat a szerkesztőbizottság nem fogad el.

A kéziratokat a szerkesztő címére kell beküldeni, aki a tanulmány beérkezését visszaigazolja. A közlésről - a lektori vélemények alapján - a szerkesztőbizottság dönt. Erről értesítik a szerzőt.

A közlésre kerülő dolgozatok korrektúráját az ábralevonatokkal együtt megküldjük a szerzőknek. A javított korrektúrát az esetenként megadott határidőig kérjük vissza. A megadott időpontig vissza nem juttatott dolgozatot kénytelenek vagyunk kihagyni a készülő számból.

A szerzőknek honorárium fejében 50 darab különlenyomatot adunk. Ennek előfeltétele, hogy a szerző a kézirattal együtt pontos címét (irányítószámmal) is bejelentse a szerkesztőnél.

A szerkesztő címe: DR. EIBEN OTTÓ, 1088 Budapest, Puskin u. 3. ELTE Embertani Tanszéke. Telefon/fax: 266-7857

A kiadvány előfizethető és példányonként megvásárolható:
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Anthrop. Közl. 38; (1996/97)

TARTALOM - CONTENTS